THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CXI. No. 2470.] LONDON, SEPTEMBER 13, 1910. [62ND YEAR. PRICE 6d.

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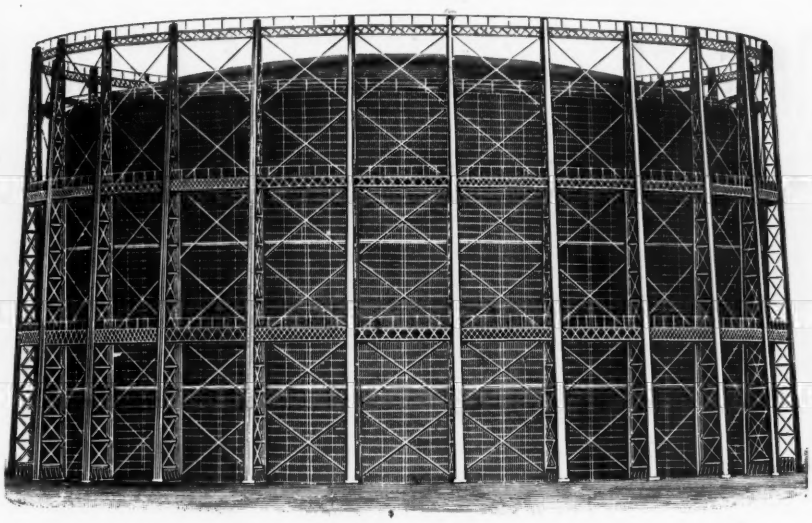

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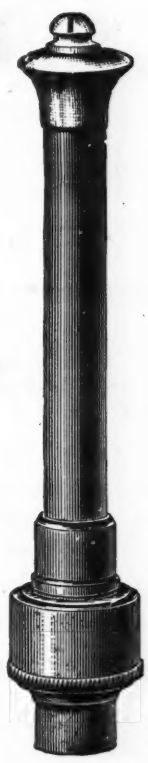

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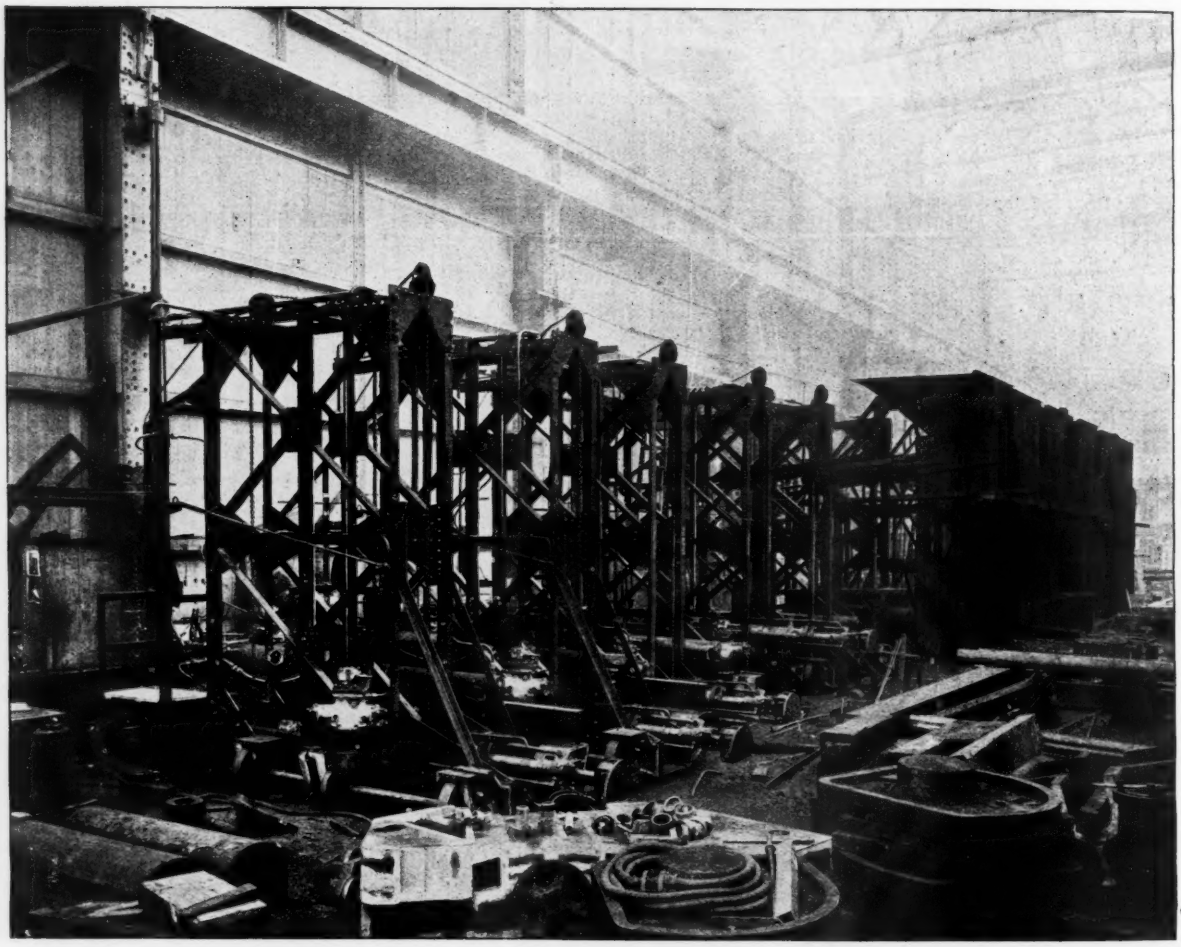

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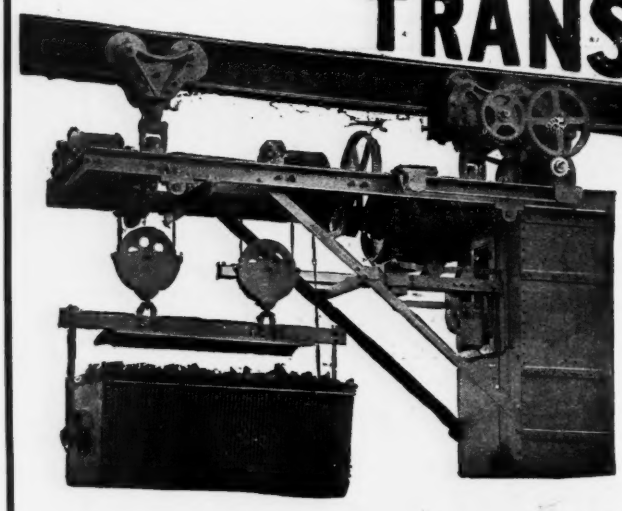

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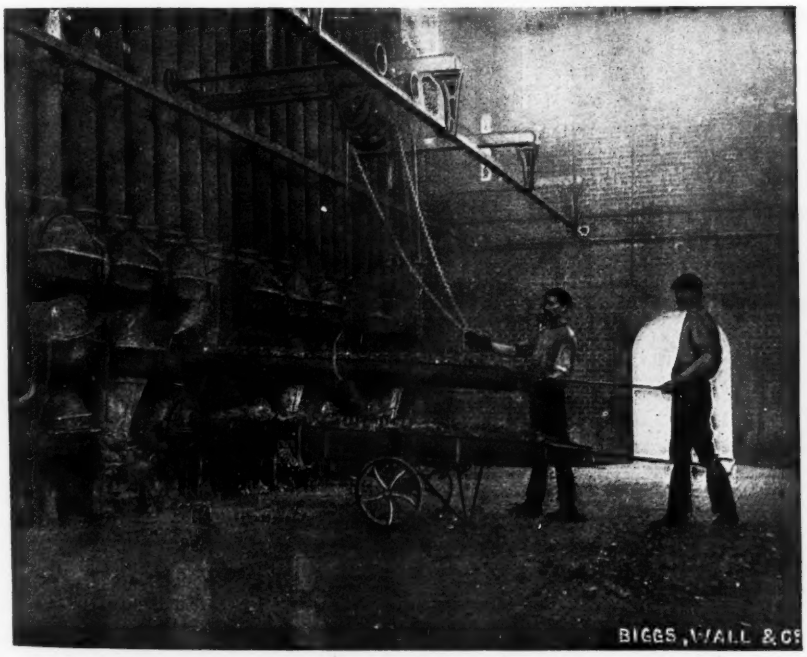

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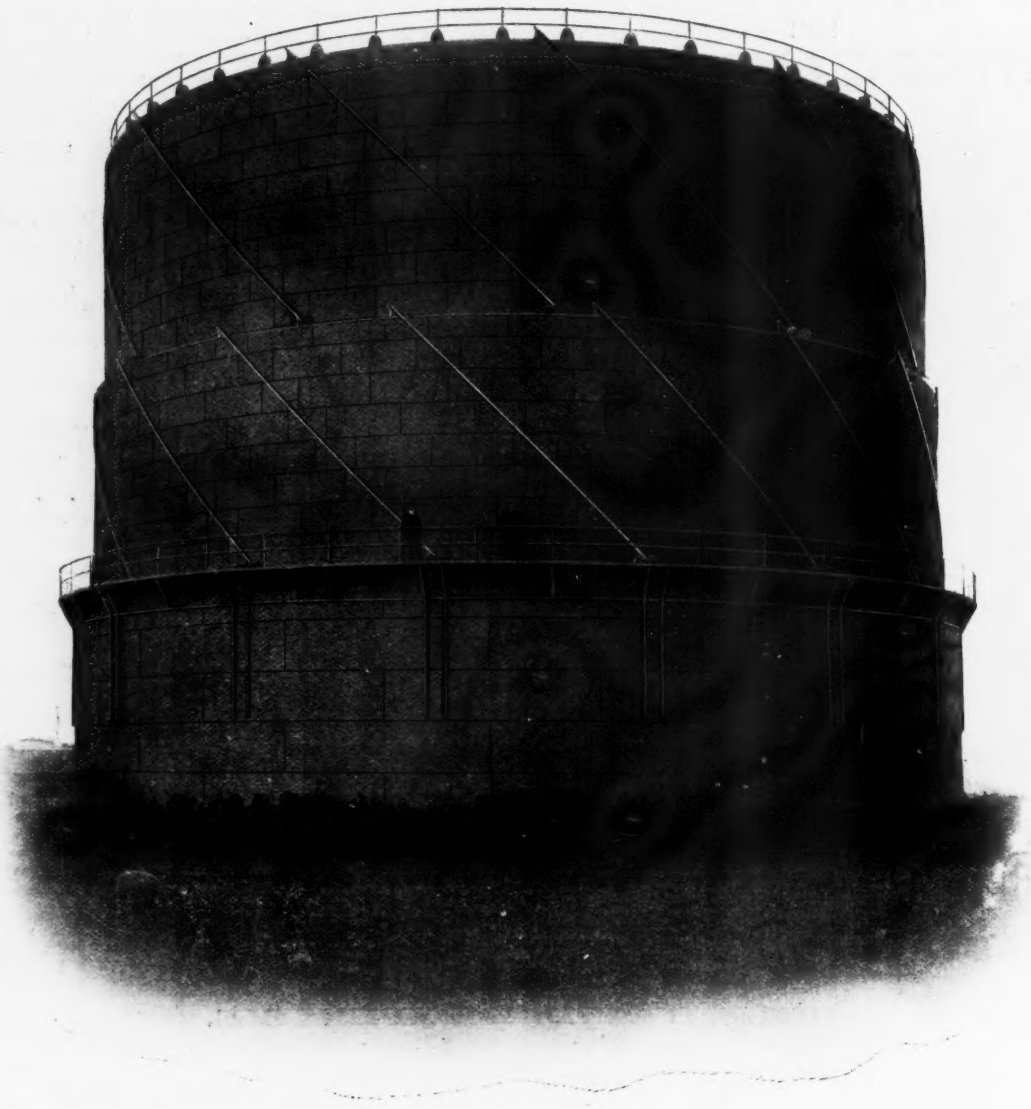

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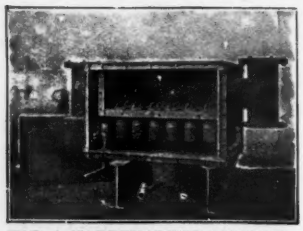

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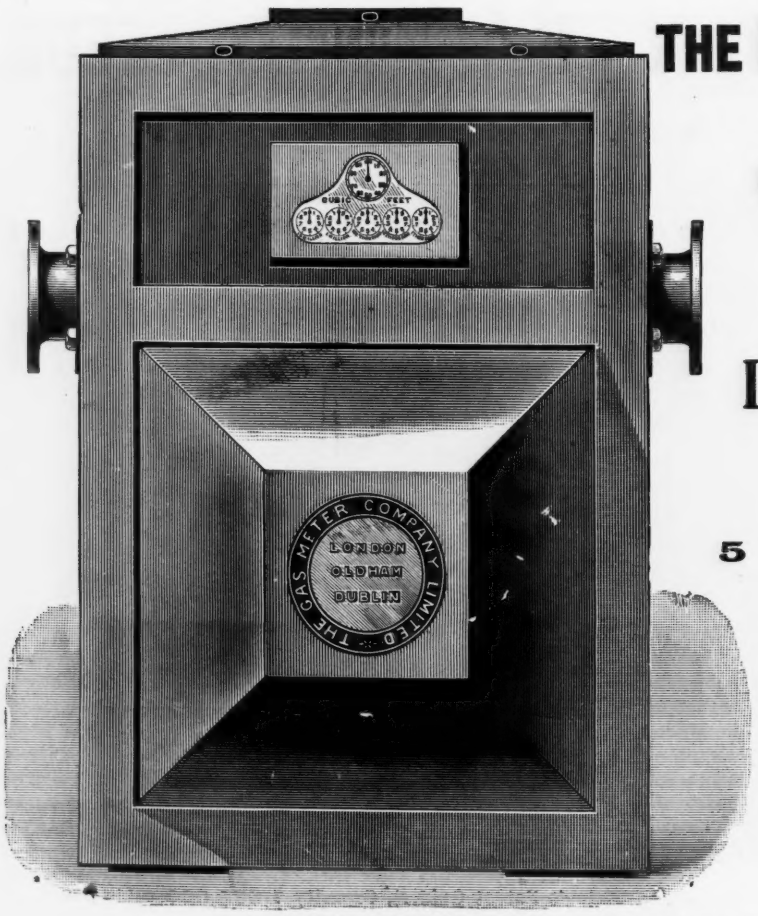

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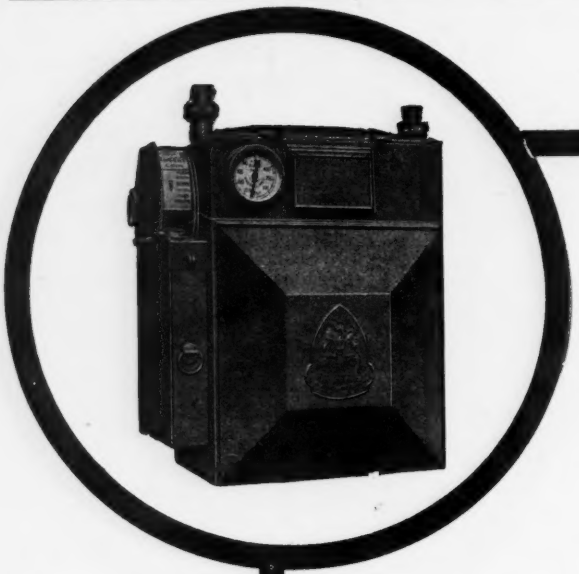

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EDITORIAL NOTES—GAS, &c.

The Improvidence of Professor Armstrong.

ABOVE the whole technical experience and knowledge of the gas industry of the world, and above all the knowledge of the industry's managers regarding commercial conditions and utilitarian requirements affecting the primary and the secondary products of gas manufacture—experience and knowledge gathered from the expenditure of millions upon millions of capital, from an annual carbonization of coal to an extent to be referred to only in terms of millions of tons, and from a commercial connection that it would require much work to even approximately measure—towers, on a pedestal of his own making, Professor H. E. Armstrong, accusing the gas industry of, and condemning it for, wrong-doing in all its primary work. The technicians of the gas industry have, in his judgment, taken a wrong turning; the whole of the course of their fundamental operations is a mistake; and the fact that the industry has been eminently prosperous, and continues to be so, must be regarded as a pure accident.

Professor Armstrong believes he knows the way to set things right for the industry. He was to have read a paper on the "Provident Use of Coal" at the meeting of the British Association at Sheffield. He read a paper; but it was in a large measure inconsistent with its title. There were some ancient generalizations in the opening about the crude uses of coal; and then the author dropped precipitately into the advocacy of low-temperature carbonization (as practised in the ill-fated coalite process) of the coal used for domestic and for gas-making purposes. So far as the gas industry is concerned, the advocacy of Professor Armstrong rides solely on the conclusions drawn from his academical and theoretical studies, without any consideration for practical and commercial interests. We had thought that the gas industry had reached high scientific and economic stages in its work; but, as a matter of fact, the carbonizing procedure of the gas industry, in Professor Armstrong's view, has gone all astray. And the glory of taking second place to another well-known professor in pointing this out to the industry is distinctly his. But we are afraid in this, as in the former instance, the effect will not be great. Since counsel came from other lips at the Society of Arts, the gas industry has, in its technical work, been hardening its heart, and has been pursuing high temperature carbonization with greater ardour than before, and with considerable financial benefit to consumers and proprietors alike. Professor Armstrong's head appears to have been turned by what he has found in coalite tar; but that he has not yet reached any very definite stage in his investigation may be gathered from the fact that, within a fifteen or sixteen line paragraph of his paper, we find supposition and inconclusiveness thickly strewn by the use of such phrases as "it must be supposed," "I am "inclined to think," "the proportions . . . appear," "the phenols are presumably," and "the greater proportion "of benzine in ordinary coal tar is probably due." The Professor certainly seems to be more than a little premature in his advocacy; and there are several other material things of commercial and utilitarian character that he must take into the reckoning before he can say that there is economic value in his proposition. There is one thing—and one thing only—about which he appears to be really definite; and it is that the gas given off in the coalite process is very rich. Granted; but from the point of view of the gas industry, that very fact cannot be ascribed to any economic or provident use of the coal employed.

However, there is no doubt that in Professor Armstrong's mind—untutored in the practical and commercial interests of the gas industry—the technicians of the industry are altogether wrong in their procedure. He is not particular how he rubs in his views. Apparently the more raucous the tone the better. Gas of the character of that of coalite gas should be substituted for the "rubbish" now produced by carbonizing coal at high temperatures in order to realize the maximum yield of gas. It is clear Professor Armstrong should carry his current investigations to the question of the combustion of gas for the purposes to which it is now applied; for we firmly believe he would find such investigation educational. The gas industry has applied science to the use of gas, as well as to its production; and in doing this, all the reasons that formerly obtained in regard to the supply of rich gas have vanished. And by applying high temperatures to the production of gas, and so increasing the yield of the coal, the gas industry is enabled to supply gas for lighting and fuel purposes at economical rates, and at the same time make a profitable thing out of it. Nevertheless, all the gas industry is doing in producing economy is a huge mistake in the judgment of the Professor. He talks airily about the provident use of coal; and yet he advocates for the industry a process whereby they would have to purchase, convey, and use—and improvidently use—millions of tons of coal more a year to supply the gas required, increase the costs of production, increase the charges to gas consumers for a commodity of a nature they do not require, and add to the supplies of a lot of commodities for which there would be no adequate demand.

It is asserted by Professor Armstrong that since the sulphur clauses in the comparatively few Gas Acts in which they appeared have been abrogated, there has been a steady depreciation in the quality of the coal gas supplied; and the damage done to furniture in consequence is most serious. It would have been fairer on the part of Professor Armstrong had he stated that only the sulphur compounds clause has been repealed, and not that referring to sulphuretted hydrogen. However, experience in the same district of gas supply as that in which the Professor resides does not confirm his declarations as to damage; and the official returns show that of late a great improvement in respect of sulphur content of the gas has occurred. As so much else pertinent to this question is manifestly not within his knowledge, it may also be external to his information that since full, or approximately full, retort charges have been adopted with high-temperature carbonization, there has been a material reduction of the sulphur compounds in gas. There is obviously much for him to learn in association with modern gas-manufacturing practices and modern uses of gas.

To follow the revolutionary Professor Armstrong would be to make a complete wreck of the gas industry. Plain it is that he does not understand the practical and commercial interests underlying the industry's present procedure. Or, on second thought, perhaps he has some financial interest in the electrical industry; and so has a selfish motive for suggesting that the gas industry should turn away from the high roads paved with economy and prosperity to those that would in these times bring upon it positive disaster. However, Professor Armstrong is harmless; and no one at the meeting appears to have paid much serious heed to his counsel to the industry to adopt as its fundamental system one that is compassed about by so much impracticability and uncertainty.

Internal Combustion Research.

THE British Association Committee on "Gaseous Explosions" are still, as the "JOURNAL" showed last week, pegging away, with good elucidating effect, at their highly technical task. The early builders of internal combustion engines could hardly have suspected that around their productions clustered so much intricate problem that would require some of the most brilliant talent of the land to unravel. But so it is. The art of gas-engine building needs, for progress, considerable light and leading from Science; and Science appears willing to give it. But looking at the report presented on this occasion, it is evident the Committee are determined to go slowly, and, in so doing, to go surely. The position of gas-engine investigation had reached such a chaotic

condition that the only possible hope of arriving at settled and approved determinations was to have a Committee of the highest rank in the necessary specialized qualification to set things in order; and there is every confidence that, though on this occasion the Committee have confined their attention to the one important factor in heat flow—radiation—the progress in knowledge will be much faster on systematic lines than when left to the work and the inclination of the individual. Not only are the Committee by their labour clearing up moot points, and, by collective wisdom and methodical inquiry, solving problems, but they are advancing knowledge. They have, as Mr. Dugald Clerk pointed out, when he was discussing the report presented by Professor Bertram Hopkinson, shown that the radiation losses in a gas-engine are larger than have hitherto been thought; and they have also exposed the danger of applying the laws governing the loss of heat in a fixed and closed vessel to a vessel which contains a moving piston. There will be agreement with the Committee that perhaps there is no service Science can at the present time render the gas-engine builder that would be of greater importance than to establish definitely the principles on which depends the heat flow from hot gases into cold metal with which they are in contact, and thus enable him to predict the effect on heat-flow of changes in the temperature, density, or compression of the charge, and in the state of the cylinder walls. It is a large question; and radiation is but a single factor in it. So it may be expected that the work will be long and exacting to which the Committee have put their hands; but every stage with such a Committee should produce some advantage. By many who have interest in the efficiencies of gas-engines, the work will appear abstruse. But even such will find many educational points by perusing the report. It is not, for example, everybody who knows that a large flame radiates more per unit of area than a small one, because a flame is to a great extent transparent even to its own radiation; so that radiation is received not only from the molecules at the surface of the flame, but also from those at a depth within it. Nor is it also appreciated that the cooling of the gas is slower in a large flame than in a small one. The work of the Committee bids fair to give for a time to come an annual supply of material from the higher realms of research that will have much practical value.

Quickened Combustion.

A CONSIDERABLE part of the "JOURNAL" last week was occupied by the reproduction of the report presented by Dr. William A. Bone, to the Physical Science and Chemical Sections of the British Association, on "Gaseous Combustion." Long as the report is, it is merely a compendious review of the vast amount of work that has been done in this field of fascinating research by both the physicist and the chemist. The compilation expresses the thoroughness with which Dr. Bone has set about the work of compressing into convenient form the lines of investigation, the conclusions, and the conflicting views of the workers of the past and the present; and it testifies to the completeness with which the chemical aspects of the extensive subject have been studied. But it is extremely difficult for anyone who has not made special and profound research into the various phases of the subject, as dealt with by Dr. Bone, to either attempt to criticize or accept anything as altogether conclusive until the seal of a common ratification is set on it by specialists. The difficulty is attested by the inconclusive general remarks made at the meeting by certain known lights in scientific realms by way of discussing Dr. Bone's report. The report ought really to be taken as the new starting-point from which to make more pronounced endeavour than hitherto to reach the goal of definite explanation of the phenomena in the different directions of investigation and of solution of the divers problems. The chemist has done a large amount of work so far; but doubt, inconclusiveness, and contrary opinion still exist. And, as Professor Arthur Smithells says, a point has now been reached in regard to the investigation of the general subject where the fuller assistance of the physicist is indispensable.

The two subjects in the report that have the largest practical interest for our readers refer to the influence of moisture upon combustion, and the influence of hot surfaces upon combustion. Concerning the former, there is still much disagreement between chemists themselves; and, in regard to the latter, there is some difference of opinion between the scientist and practical man, but not so much as has been suggested. The section of the report dealing with the latter matter does not advance it much, if anything, beyond the point where Dr. Bone left it at the time he delivered his lecture before the North of England Gas Managers' Association in 1909. We will not therefore here attempt, by the extraction of passages from the lecture, to delineate the past and current view. The question is one of practical importance to all users of furnaces, gas-fires, and the like in which combustion of gases takes place for the purpose of obtaining heat. And in this line of research into gaseous combustion, we have one in which perhaps more than in all others, the consensus of competent opinion is favourable to the dictum of Dr. Bone that "heated surfaces have "undoubtedly a marked influence in accelerating not only "combustion, but all chemical interchanges in gaseous "systems." This is iterated in the words: "I have reason "to believe that, in the firing of furnaces, and so forth, the "surface plays a very important part in the development of "the concentration of heat."

But while this view is now generally accepted by technologists, there is the danger, through misconception in other quarters of terms and practice, of an undeserved decrying of the general conclusion at which long since some of the early experimentalists arrived, and which Dr. Bone confirms in the light of accumulated knowledge and of the results of experimental work under the more advantageous conditions of the present time. Mr. F. Siemens, more than twenty years ago, put forward the theory that the proper heating of a furnace is entirely due to radiation in contradistinction to actual flame-contact, and that in connection with gas-fires, for the attainment of maximum efficiency, radiation from a free burning flame must be relied upon. Had it not been for this theory, there would have been less said to-day as to the divergence between practice and the accepted scientific view, that surface-contact is favourable to the acceleration of combustion. Consider the combustion of gases in retort-benches to-day, there is a tremendous amount of combustion going forward in every setting in contact with heated surfaces; and the efficiency of the heating is great. Consider, too, the ordinary fuel gas-fire, there is (though the form of the fuel has changed to the straight elongated type) a large amount of heated surface provided by which combustion may be readily accelerated. In the last report by Mr. E. W. Smith to the Gas-Heating Research Committee of the Institution, he stated—perhaps the point has some slight bearing—that, in using half-fuels (cut vertically) in the same position as they would occupy had the complete fuel been used—thus having practically a free-burning flame—instead of the radiant efficiency being increased by the removal of the front of the fuel, it was actually slightly decreased. But when the half-fuels were rearranged, in order to catch the flames better than they did when in their usual place, the radiant efficiency increased to the figure obtained when whole fuels were employed. But all this goes to show that, in this matter, there is in reality no great divergence between practice and scientific view.

There is much more work to be done in this connection. The fact of hot surfaces accelerating combustion is being generally scientifically endorsed; but, perhaps of academic more than immediate practical interest, there now falls the elucidation of the factors that are operative in surface combustion. Dr. Bone defines the lines of investigation in order to arrive at determination in this connection; but there are many pitfalls in the way by which there may be vitiation of result. The avoidance of these would be best secured by systematic research under adequate supervision.

Failures of Gas and Electrical Machinery.

IN an article appearing in other columns, we have dipped into the annual report of Mr. Michael Longridge, M.A., M.Inst.C.E., the Chief Engineer of the British Engine, Boiler, and Electrical Insurance Company, Limited, upon the failures of gas and electrical machinery that came under the observation of the Company's experts during the year. These reports are always instructive; but it is somewhat strange that, with all the accumulation of experience regarding failures, and taking into consideration also the numerous new engines and other machinery that go to swell the total of the insured plant, the ratio of the breakdowns to the total keeps at an almost level line. In this report, the proportion of one failure to every 10·4 gas and oil engines insured is but a slight variation from the returns for immediate past years. The failures are distributed over several causes—among

which are weakness and bad design, metallic defects, and neglect on the part of the users. The weakest parts of gas-engines are undoubtedly the crank-shafts; and the question is asked by Mr. Longridge whether the time has not arrived when these parts should be built-up, instead of being forged in a single piece. There is no question, too, that makers must pay more attention to the character of the metal of which the different parts are constructed, in order to enable them to withstand the various stresses to which they are constantly exposed. But there is evidence that manufacturers of plant built-up of metal parts pay considerably more attention to this important matter of metal composition than was their wont only a few years since. For example, among others, pipe-founders and gas-fire makers have discovered the advantage of this. By scientific investigation in this regard, and the adoption of proper mixtures, good reputations for durability are now being secured; and some reward will follow. But in connection with the failures, the manufacturers of gas-engines must not be apportioned more than their due share of blame; for at least a quarter of the breakdowns recorded during the year were due to neglect on the part of users. They have only themselves to reproach for this; and it is a great pity they do not take to heart the fact that all mechanical contrivances require proper care and treatment. Cleanliness and thorough upkeep are repaid by efficiency and by escape from the worry and loss attendant on disablement. In the case of electric motors, the proportion of failures was rather worse than in that of gas and oil engines. The ratio was with motors on continuous current 1 in 8·2, and on alternating current 1 in 9·5. Users' neglect is also responsible in these cases for a goodly part of the breakdowns. But a notable feature of the figures is the growth year by year of the unascertained causes of motor failure. Many things, it is notorious, happen in connection with electricity, the causes of which are inscrutable.

The Clapham Catastrophe.

There was a strange little paragraph in the "Electrical Times" last week, under the heading of "Sequel to the Clapham Fire," in which paragraph "Meteor" seems to have been soliloquizing, and to have allowed his thoughts to wander at random between the unfortunate Robinson Crusoe, the electrical and the gas press, and the tragic fire last Christmas at Messrs. Arding and Hobbs at Clapham. That fire, the jury who inquired into the cause of the deaths of the several victims, positively declared was due to an electric lamp, though the "Electrical Times" persist in referring to this as the "alleged" cause, just as we suppose it would do if it were alluding to the Accrington fire, to one of those that has recently occurred at Brixton, and to others that might be mentioned. But the intended cardinal point of the vapoury paragraph is not Robinson Crusoe nor the cause of the Clapham fire; but that Messrs. Arding and Hobbs are in their new premises about to spend some £3000 on the installation of the electric light. From this circumstance our electrical contemporary concludes that "electric light, after all, is the safest method to adopt if artificial lighting has to be used at all." If this is the only fact on which conclusion is based, then "Meteor" must surely have been sojourning for a considerable time like Robinson Crusoe on a desert island, and has not heard of other lamentable occurrences that have helped to give the "safest" theory its death blow. We suggest that other considerations may have had some influence with Messrs. Arding and Hobbs. It was impossible, after what has occurred, for the Battersea Borough Council Electricity Department to allow the firm to have their new premises lighted by gas; and so the Department made the tempting offer of a supply of electricity at 2d. per unit, which is a price at which other private lighting consumers cannot get electricity from the Borough Council. It does not require any very great stretch of the imagination, too, to suggest that, the Borough Council and the rating authority being closely identified, Messrs. Arding and Hobbs had no desire to fall-foul of the Electricity Department by transferring their custom at this particular juncture. And the firm have also the comforting knowledge that the Electricity Department and the Insurance Companies (who have been badly hit lately through electric lighting) will keep a sharp eye on the new installation, so that all that is humanly possible may be done to prevent a recurrence of the terrible disaster that caused such widespread sorrow and gloom last Christmas.

Politics in Municipal Government.

The idea of local government on political party lines is not one that commends itself to everybody; but Sir Edward Russell, in a speech delivered at Liverpool last week, showed that he is among the number who regard it as the ideal method of carrying on a town's municipal business. In presenting his argument, he admitted that many persons disagreed with party men in carrying politics into municipal elections; and he "recognized that these persons claimed to be very superior persons indeed, and were very sure that they were right," and that "there was a disposition to accept this idea as one which all intelligent folks ought to be ready to agree with." We must ourselves plead guilty to having, on occasion, expressed the view that politics might with advantage be separated from municipal affairs. But whether, after this overwhelming avalanche of—sarcasm, should it be called?—we shall ever again give voice to the same opinion, time alone will show. Sir Edward himself prefers the old practice of both political parties working up their strength to the utmost in the wards of a city, as being a good thing for local politics, and a firm foundation for interest in Imperial politics—in short, as the best course which could be taken considering the existing circumstances. In a free and democratic country every citizen was, he argued, a trustee for the past, the present, and the future of the city and the country; and if a citizen failed to realize, and to act up to, his trust, in which he had a life interest, he endangered the continuance of citizenship and of present blessings and gains to posterity. The first duty of the electors was to send the right men into the Council; and, secondly, it was their duty to select the right men on grounds of party fealty and party intelligence. With the first of these objects, there can be no disagreement whatever; the only point is as to how it can best be done. Sir Edward says, in his second clause, that the right men should be selected "on grounds of party fealty and party intelligence;" while the "superior persons" might claim that a better way would be to vote for a candidate strictly and only on the grounds of his personal fitness for the position of a councillor. Which idea is the more likely to conduce to the efficiency of the administration of city affairs?

Party Considerations.

It would doubtless be argued by those holding Sir Edward Russell's opinions that the party leaders would be careful to select suitable candidates. But, even so, the candidate of one political colour might be far and away more suitable than the nominee of another; and if this more suitable man is kept out of the council because the majority of the electors happen to differ from him in politics, is it likely that citizenship or the city can be the gainer thereby? Has Imperial Government on strictly party lines proved such a huge success on all occasions that the universal incursion of its cast-iron methods into municipal affairs can be conclusively accepted as an unmixed good? It is true that Sir Edward asserts it is the best course which could be taken "considering the existing circumstances;" but the qualification is one that can hardly be taken into account without knowing what other circumstances might be contemplated. However, the speech referred to was delivered to the Liverpool Liberal Federal Council; and perhaps this paragraph may be fittingly concluded with an extract from it: "What was practically the aim of Liverpool voters when they gave their vote as a party vote? Their main aim was, to put it in plain terms, 'to get the Town Hall'—and a very good aim, too, because those who got the Town Hall exercised great influence upon public opinion and upon public measures, and they kept their side up, so that, whatever exigencies arose, and whatever might be the necessary course at any particular moment in reference either to local or general politics, they had a 'vantage ground, and were in a position from which they could most serviceably and usefully act for their party. But the advantages to be derived from a successful assailing of the Town Hall were not the only objective of the Liberal party in Liverpool. The Liberal party had very seldom got the Town Hall, and only for a comparatively short time when they had got it. But did it follow from this that the Liberal party had been inoperative, inactive, and without influence on the public affairs of the city? He had watched these affairs for a good many years; and he felt that they were entitled to regard the influence of the Liberal party as among the greatest factors for good in the city."

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 735.)

BUSINESS last week on the Stock Exchange was almost a dead-calm. Whether it will prove a record in quietude remains to be seen; but at any rate it will be difficult to beat in point of stagnation. And yet the tone continued wonderfully cheerful as a general rule, except where (as in Railways, for instance) special circumstances arose to depress the feeling. On Monday, business opened in very sluggish mood; but the tendency was firm. Gilt-edged securities were cheered by cheap money, Railways brightened up a bit on labour difficulties promising a solution, and Wall Street was shut and ceased to agitate. Several gas quotations advanced. Tuesday, things continued just about the same, with unimpaired cheerfulness. Consols had a small rise, Railway prices ruled higher, and the Foreign Market was firm. Americans were steady until near the close. Gas again was in good demand. On Wednesday, the lack of business was beginning to dull the cheerful tone, but not much. Government issues were fairly steady; but Railways were somewhat dashed by the non-settlement of the labour trouble, and Americans were rather poor. On Thursday, there was hardly anything doing—approaching absolute inertia; but the tone recovered a little. Excepting Railways, pretty well all lines were firm, and Gas again was in great request. Friday was quieter than ever—so some members said; but that seemed almost impossible. Gilt-edged were firm, and the Foreign Market steady; but the protracted contest in the North depressed Rails. Saturday was very quiet, of course, and brought no change to speak of. In the Money Market, there was an abundant supply, and rates relaxed considerably. Discount eased also; but it steadied again before the close. Business in the Gas Market was quite up to the mark considering the time of year; and the tendency was all in favour of higher prices—several quotations scoring nice advances. In Gaslight and Coke issues, the ordinary was strong, with transactions at from 105½ to 106¼—a rise of ½. In the secured issues, the preference realized 103 and 104, and the debenture 80¾ and 81. South Metropolitan was quiet but firm, changing hands at from 120½ to 122½—a rise of 1. The debenture marked 79½. There was only one transaction in Commercials, a bargain in the 4 per cent. stock at 108—a rise of ½. Among the Suburban and Provincial group, Bournemouth "B" was done at from 16¼ to 16$\frac{7}{16}$, British at 45½ (a rise of ½), Brighton original at 216 (a rise of 5), ditto ordinary at 156 (a rise of 4), Ilford "A" at 149½, Portsea "A" at 132 and 133, South Suburban at 120½, and ditto debenture at 121½. On the local Exchanges, Liverpool "A" marked 216; and Sheffield "C," 229. In the Continental companies, Imperial realized from 185½ to 187 (a rise of 2), ditto debenture from 92¾ to 93¼, Union 96½ and 97 (a rise of 3), ditto preference 138 (a rise of 2), and European 23$\frac{9}{16}$. Among the undertakings of the remoter world, Cape Town debenture marked 89, Melbourne 4½ per cent. 102½ (a rise of 1), Monte Video 12$\frac{7}{8}$, Primitiva 7¼ and 7$\frac{3}{8}$, ditto preference from 5¼ to 5$\frac{11}{16}$, ditto debenture 97½, River Plate debenture 98¼.

ELECTRICITY SUPPLY MEMORANDA.

Comparing Old-Style Vertical Gas-Burners with Metallic Filament Lamps—Results of Correction to Current Conditions—Improved "Therol" Water-Heater—On Lamp Columns—The Facts of Alderman Blagdon Richards—The Anglers at Holmfirth.

THE shock that the inverted gas-burner has given our electrical friends in public lighting is causing them to leave no stone unturned to mitigate the (to them) evil effects. One of these evil effects is that the successes of gas have not tended to the hardening of the price of the capital stocks and shares of electricity supply companies; and so an attempt has been made in the "Financial News" to provide a set-off against the successes of gas in competition by quoting what is being done at Marylebone, Hampstead, and Shoreditch, which boroughs are not supplied with electricity by companies, but by the Councils' own undertakings. This fact is worth consideration by financial contemporaries when invited to devote the best part of a column of space to the publication of material that, so far as gas is concerned, has no application to the new order of conditions brought about by the later types of inverted gas-burners. A second fact might also be noted by them—that the price charged for current by their municipal illustrations is not the price charged to private consumers. In the case of Marylebone, for instance, the price allowed for current used in the double and triple lanterns, fitted with 55 and 88 watt electric lamps, is only 1·42d. per unit, which is pence below the figure paid by all private consumers for lighting purposes. The price stands in queer contrast with the grotesque figures recently published by Mr. Seale and others regarding the charges for gas by the Gaslight and Coke Company, and on which figures criticism was passed in our editorial columns last week.

The next point our financial contemporaries might note is that the comparisons as to costs (such as the "Financial News" has published) are based upon the old type vertical form of gas-burner with the newest types of metallic filament electric lamps; while the comparison that should be made is between the newest forms of inverted gas-burner and metallic filament lamp. It will suffice to take Marylebone as an illustration; and use the recent tender made to the Holborn Borough Council by the Gaslight and Coke Company—a private concern depending solely upon their profits for dividends—as an example of what they can offer with the newest inverted gas-burners. Only one portion of the street lighting of Marylebone is dealt with in the article that has appeared in the "Financial News." This portion comprises 1114 single-burner lamps, 827 double-burner ones, and 23 triple-burner ones; and, on the Holborn figures, it is easy to show that, on this section of lighting alone, the ratepayers annually (without taking into account the enormous capital expenditure involved in conversion from gas to electricity) will lose a considerable sum, and be also deprived of the considerable additional illuminating power in their streets that would be obtained if inverted gas-burners were being installed instead of the metallic filament lamps. In the single-burner lamps, the old style gas lighting was by vertical burners, each costing £3 7s. 6d. a year. These are superseded by two 35-watt metallic filament lamps (giving together 56-candle power) at a cost of £3 2s. 9d. per annum, whereas the Gaslight Company quoted the Holborn Council for the new style inverted gas-lamps £2 7s. 6d., each giving 80-candle power. In price, there is a difference here in favour of gas of 15s. 3d. per lamp (remember the low price charged per unit of electricity for street lighting); and in illuminating power, of 24 candles per lamp. On the 1114 single-burner lamps, the difference in cost per annum is £849 8s. 6d.; and 24 candles per lamp additional illuminating power on 1114 lamps represent a total of 26,736 candles. These are the annual and the illuminating power losses to the ratepayers on these lamps alone.

In the same section of lighting, we have the 827 double-burner lamps. The original cost of each of these with the old-type gas-burners was £5 19s. 5d. The annual running cost for two 55-watt metallic filament lamps is £4 9s. 6d.; and the two lamps together represent only about 90-candle power. For two 80-candle power inverted gas-lamps (160-candle power per post), the quotation to Holborn was £3 18s.—the difference in cost between the Marylebone electricity charge and the Holborn inverted gas-burner tender being 11s. 6d. per lamp, and in illuminating power 70 candles. The total losses, therefore, on these 827 lamps is in cost per annum £475 10s. 6d.; and in illuminating power, 57,890 candles. The last-named figure requires altering somewhat, because the Council found the lighting by the two 55-watt metallic filament lamps so "unsatisfactory" that they put in their place two 88-watt (70-candle power) lamps in important thoroughfares—the change representing a loss to the electricity undertaking per post so altered (assuming 4000 hours lighting a year) of 264 units of electricity per annum. But we may ask if two 55-watt lamps were found unsatisfactory, what must the illumination be like by two 35-watt lamps with which the major part of the standards are fitted? Then we have the 23 triple-burner lamps. The cost per annum with the old type gas-burners was £8 16s. 11d. They are superseded by three 88-watt (70-candle power) metallic filament lamps, giving a total of 210-candle power, and costing £6 14s. 6d. The Holborn quotation for triple-burner lamps (80-candle power per burner, or 240 candles for the three) is £6. Thus the losses on these figures to the Marylebone ratepayers is in money cost 14s. 6d. per lamp, and in illuminating power 30 candles; or on the 23 lamps £16 13s. 6d. per annum, and 690-candle power. Summing up, on this one section of the Marylebone lighting, comparing with the Holborn inverted gas-burner tender, we have an annual running loss of £1341 12s. 6d., and of illuminating power of 85,316 candles. As already mentioned, an allowance on the candle-power figure has to be made for the change in a number of the 55-watt lamps to 88-watt ones. It will therefore be seen that the Marylebone ratepayers stand to lose a considerable sum and a considerable quantity of illumination when the lighting conversion scheme is completely carried out—that is in contrast with what can be done with the new inverted gas-burner, and not by comparing, as in the article which has given rise to this comment, what can be done by old-style gas-burners and what can be done (only with low prices per unit for current) with metallic filament lamps. A little examination by our financial contemporaries of the figures quoted here, will enable them to appreciate the value of taking in this matter the common level of current circumstances for both illuminants.

When the "Therol" electric water-heater first saw the light of day, we ventured to call attention to its limitations. It will be remembered that it was solemnly trumpeted by our electrical contemporaries as a great boon and blessing to every household; while it appealed to us as one of the most humorous inventions of the age. The householder who had installed a 200-watt-per-hour "Therol," and who wanted a bath, could—assuming that some one had just used up the stored warm water—before it would furnish another sufficient supply of warm water for the bath, travel from (say) Brighton to Edinburgh and back; and if there were seven members in his family, as only one person per day could have a bath of 25 to 30 gallons of water at 110° Fahr., he could then take a week's holiday before his turn to use the bath would come round again, and always providing no water was used for any other purpose in the meantime. The same "Therol" could only give 9 gallons of boiling water per twenty-four hours. And "if a sudden call was made on a heater for 3 gallons of boiling water at once, it *may* respond quite satisfactorily. But should a further 3 gallons or so be required at boiling-point within (say) an hour or so, it might not be available, since the temperature of the heat storage block might not be high enough

to give the further amount *for some hours*, as it only provides sufficient energy to raise every hour a gallon of water to 110° Fahr., but permits 9 gallons of boiling water to be drawn off in all during the day." This inefficient heater, with all its limitations, which make it impracticable for use in the household, takes 4·8 units of electricity per twenty-four hours. But there has been a development in the heater which raises its energy-consuming capacity, and its yield in warm or boiling water. The very criticism that we passed when the heater was introduced is justified by the development. It has now been arranged to insert a supplementary heating coil—taking (say) 1000 watts an hour—which is switched into parallel with the original unit by means of a thermal contact and relay. "With" [the "Electrical Times" will excuse quotation from it] "1200 units passing through the iron block [per hour], it is *not long* before the temperature is again raised to the required maximum, when the supplementary heating coils are cut out, and the consumption drops to the usual 200 watts." The original form of heater was not a success—it was not economical; and it was not a practical adjunct for the household. Neither is the form as developed an economical and rapid means of obtaining hot water. The gas water-heater would not have risen into popularity as it has done if it suffered the limitations of its "Therol" competitor. The range of invention that our electrical friends pack under the headings of "practical" and "economical" is really most ludicrous.

Some of the original gas-lamp standards have not much about them in regard to artistic merit of which to boast; but the newer types of standards are certainly a great improvement upon the old. When electricity was first employed for public lighting by means of arc lamps, there was gentle scoffing on our part at the cumbrous creations—creations of great girth and height, and not pretty to look upon—that electricians introduced into the streets. Now that the electric metallic filament lamp has come, and electricians are finding them more economical in their over-all costs, though less efficient from the consumption and lighting power point of view, they are magnifying in places the incongruous proportions of standard to lamp, by removing the arc lamps, and putting at the head a single metallic filament lamp or a cluster. Whereat one cannot refrain from smiling. Apart from being hideous, it reminds one of the old simile as to the use of elephants for picking up pins. Now where special standards are made for metallic filament lamps, the designers seem to have gone to the extreme in plainness and economical structure. Some of those we have seen appear to be built up of varying diameters of plain tubing—decreasing upwards, and finished with a swan neck. "A Visitor" to Carmarthen has recently written to the "Welshman," and has had something to say as to the inartistic character of the standards that have been set up in the streets, and their unfitness in the old-world character of the town. He describes the standards as "frightfully aggressive" and "hideously ugly;" and he thinks that, if electric lighting was "a necessity," some system more artistic and more in character with the place could have been installed quite as cheaply and as efficiently, without offending every canon of good taste. From what has been seen in other places, we have no doubt this correspondent is not by any means captious or hyperbolic in his criticism. But he goes further, and asserts that the electric lighting installation is the most crude and primitive that he has seen. He is not alone in his opinion.

The Carmarthen Town Council wanted the electric light; and now they have got it the inhabitants are not altogether satisfied—judging from the letters and comments in the "Welshman." Among the letters, Mr. B. A. Lewis, the Manager and Secretary of the Gas Company, has shown how, in the public lighting, the town is losing annually, as compared with gas, owing to the cost of the service; and we undertake to say that the service is less efficient than it would be using the modern form of inverted gas-burners. But note-book in hand, a representative of our Welsh contemporary has given Mr. Alderman H. E. Blagdon Richards an opportunity of defending the electric light. Than he, "no public man within the ancient borough is better acquainted with the facts." If the interviewer has faithfully transferred to the public what Mr. Blagdon Richards said at the interview, then we cannot congratulate the latter gentleman, nor the ancient borough on a knowledge of facts by some of its public men. The Alderman appears to think gas managers and others interested in gas are, as a class, eminent for their want of veracity, because he says: "I have noticed that all arguments advanced that gas is cheaper than electricity are merely statements emanating from gas managers and those largely interested in gas; and those inflations of statements are easily understood." That is a nasty and discourteous reflection. But the Alderman shrewdly avoids showing, by concrete example, wherein the inflation arises. We do not think Alderman Blagdon Richards exhibits himself in a good light as a judge of the ethics of this matter, as he himself says that, before gas can compete with electricity at 5d. per unit, it will have to be reduced to 3s. or 2s. 9d. per 1000 cubic feet. This is an exaggeration that is unpardonable in the public man who above all others in Carmarthen is "acquainted with the facts." But let us see. With the best metallic filament lamp, one can only secure 800 candle-hours (taking an efficiency of 1·25 watts per candle power) by the expenditure of a unit of electricity. With gas at 3s. per 1000 cubic feet, 5d. will purchase 138 cubic feet; and with an inverted burner, one can get an efficiency of at least 20 candles per cubic foot of gas consumed per hour, and more with certain makes of burner. Therefore, the fivepennyworth of gas will give 2760 candle-hours. We ask Alderman Blagdon Richards whether this is an inflation, and whether it cannot be substantiated. If he puts us into the class to which he has arbitrarily consigned all gas managers and others interested in gas, we will challenge him to disprove our statement. Meanwhile, we fancy over this question that the Alderman shows "inflation" in more senses than one, which is not nice in a public man who is supposed to be better acquainted with the facts than anyone else. We are not surprised that in Carmarthen there is not general gratification over the electric light.

The tradesmen of Holmfirth had better make sure as to their ground before they proceed further than the general resolution they have passed, at a meeting convened by their own Association, to support the District Council in going in for an electric lighting scheme. The Yorkshire Electric Power Company are prepared, on a sufficient guarantee being forthcoming, to extend their cables and supply the Council with electricity in bulk; but before the tradesmen give any definite guarantee regarding their patronage, they had better ascertain thoroughly, and not in the superficial manner that was done at the meeting in question, what electric lighting will mean to them as individuals in the matters of installation expenses, and running and renewal costs, and what it may mean to them as ratepayers if the concern does not turn out to be successful. Brighouse was quoted at the meeting as a place where electricity supply is provided in bulk to the local authority by the Yorkshire Company. But at Brighouse there has been electricity supply since 1897, and a bulk supply since April, 1909. Though all these years have passed, there are at present only 112 consumers; and the charge for lighting is 5d. per unit, and for power 4d., 3d., and 2d., although the price paid for a supply in bulk is only 1¼d., with a sliding-scale according to the load-factor. It will thus be seen there is a large difference between the price per unit of bulk supply, and the price that must necessarily be charged by the local authority. It will be well to investigate the financial records of Brighouse to ascertain what has occurred there in regard to deficits and profits. At the tradesmen's meeting, the Brothers Mitchell, of Brockholes and Huddersfield, who are presumably experts in the electrical business, were present in order to give information to the tradesmen, who were so thoroughly enamoured of their specious statements that the resolution already referred to went through. So as to vindicate the use of the word "specious," we may refer to this statement of Mr. Herbert Mitchell as an example: "Taking 4d. per unit as the standard price, they could use a 16-candle power metallic filament lamp for sixty hours for 4d." Now do the Holmfirth tradesmen know what a 16-candle power light is like? They would feel sick if they tried to light any of their rooms by one. Furthermore, we calculate that a unit of electricity would last, with one of these tiny illuminating power lamps, fifty hours not sixty; and there is no guarantee Holmfirth is going to get electricity at 4d. per unit. On the other hand, with gas at 3s. 1d. per 1000 cubic feet, a 20-candle power bijou inverted light can be run on the 108 cubic feet of gas purchasable for 4d., for 108 hours. Again, Mr. Mitchell said that eight of the 25-candle power electric lights would adequately light the Council Chamber. This only represents a total of 200-candle power. We believe the Council Chamber is at the present time lit by eight inverted burners, each consuming 3 cubic feet of gas per hour, which will give a total of 480-candle power on less than a pennyworth of gas (at the Holmfirth price) per hour! Comparison need not be carried further. The tradesmen of Holmfirth, however, will see from these figures that there are two sides to this lighting question; and that the greatest economy is on the side of gas.

PERSONAL.

Mr. H. WILKINSON, of Cleator Moor, has been appointed Working Manager of the Arlecdon and Frizington Urban District Council's Gas-Works.

Mr. WILLIAM EWING, who recently resigned the managership of the Greenock Corporation Gas-Works, after holding the appointment for eight years, has been unanimously chosen as Engineer and Manager to the Lochgelly Gas Company, Limited, Fifeshire, in succession to Mr. J. D. Keillor, who has been appointed Manager at Ardrossan.

Alderman F. S. PHILLIPS, J.P., the Chairman of the Salford Corporation Gas Committee, has accepted the invitation of the Town Council to become Mayor of the borough for next year. Alderman Phillips has been a member of the Town Council for 25 years, and, as Chairman of the Gas Committee, has rendered valuable service to the ratepayers.

Mr. A. S. B. LITTLE, son of Mr. Gilbert Little, who, it will be remembered, left England some time ago and took up the position of Engineer and Manager of the Howard Evens Company, gas engineers and fire-brick manufacturers, of St. Louis (Mo.), has, we learn, been appointed General Manager and Chief Engineer of the Consolidated Gas Plant and Chemical Engineering Company, of Nashville (Tennessee).

As our readers will remember, Mr. W. R. HERRING, in order to devote more time to practice as a Consulting Engineer, has resigned his position as Chief Engineer and General Manager of the Edinburgh and Leith Corporations Gas Commissioners' undertakings (though retained by the Commissioners as Supervizing Consultant). As a still further step in the projected

transference to London, Mr. Herring has now taken offices in Palace Chambers, Bridge Street, Westminster, from which he will conduct his future practice. To that address, all future communications relating to professional affairs should be sent.

Mr. J. D. KEILLOR, who, as already stated, is leaving Lochgelly to take up the position of Gas Manager at Ardrossan, was a few days ago waited upon by the workmen of the Lochgelly Gas Company, when Mr. Peter Heggie presented him with a silver cigarette-case and a gold-mounted umbrella with an inscription, also an umbrella for Mrs. Keillor. In making the presentation, Mr. Heggie referred to Mr. Keillor's abilities as a Gas Manager and Engineer, and to his considerateness towards his workmen, who had shown how they appreciated and esteemed him by subscribing for the presents. He hoped these small tokens would remind Mr. and Mrs. Keillor of their sojourn in Lochgelly. Mr. Keillor, in reply, thanked the workmen for their presents, and assured them that he valued them highly, as showing their good feeling towards him. He was glad to say that his position as Manager had been a pleasant one so far as the workmen were concerned, as he considered, by the manner in which they discharged their various duties, he had one of the best staffs of workmen in a small gas-works in Scotland. Mrs. Keillor afterwards entertained the workmen, when a pleasant evening was spent.

OBITUARY.

THOMAS WHIMSTER.

MR. THOMAS WHIMSTER, F.R.S.S.A., formerly Gas Engineer and Manager at Perth, died at his residence in York Place, on the afternoon of Wednesday last, in his 92nd year. Mr. Whimster was born at Kinghorn, in Fifeshire, in 1819. He spent his youth in Dundee. Taking an interest in gas manufacture, which was then a young industry, he (in 1847) entered the service of one of the two Gas Companies which then supplied the City of Perth. In 1851, he became Manager of the undertaking; and for the long period of forty-four years he acted in that capacity—first in the employ of the Company, and afterwards with the Corporation, who acquired both undertakings in 1871. In 1895—after he had, by request, submitted a report upon the subject of erecting new gas-works at Perth—he resigned his post, and had since lived in retirement, in Perth.

When he went to Perth the price of gas was 7s. 6d. per 1000 cubic feet; when he retired, it was being sold at 2s. 9d. In 1847, the annual consumption of gas in Perth was about 24 million cubic feet; in 1895, it was about 124 million cubic feet. Previous to Mr. Whimster's appointment, the unaccounted-for gas was as high as 33 per cent. in the Old Company's works, and 45 per cent. in the case of the New Company. But, under his careful management great improvement was made; the leakage having been reduced to less than 10 per cent. In 1868, the two Companies were amalgamated, Mr. Whimster being retained as Manager; and, as stated above, in 1871 the Corporation acquired the undertaking. In 1873, the works of the New Company were sold, and the works of the Old Company, in Canal Street, were extended. Mr. Whimster's management was of the progressive order. He was always ready to adopt new methods of working, in illustration of which it may be stated that in 1883 he had the Peebles oil-gas process introduced into the works at Perth. He retired before the new gas-works at Friarton were agreed upon; but at their inauguration (in April 1901) the Corporation did not forget Mr. Whimster's long and honourable service to the City. The ceremony of opening the new works was preceded by the closing of the old works in Canal Street, which was done by Mr. Whimster stopping the exhauster. He was then presented by the Corporation with a silver salver, suitably inscribed, as a token of appreciation.

Mr. Whimster was, in his day, an active member of the North British Association of Gas Managers, of which body he was twice President—in 1865 and in 1883. He continued to enjoy good health till last spring, when he had a serious illness, from which he never altogether recovered. Up to that time, notwithstanding his great age, he was able to move about with wonderful freedom.

Natural gas fuel is reported, says the "Engineer," as being used for the locomotives of the Texas, Arkansas, and Louisiana Railway. The gas is carried in a tank on the tender; sufficient tank capacity being provided for six hours' run. The line has two locomotives and one car, and is credited with 8 miles of track.

The Newcastle-on-Tyne Association of Students of the Institution of Civil Engineers, have, by permission of the Directors of the Sunderland and South Shields Water-Works Company, and of Mr. A. B. E. Blackburn, Assoc.M.Inst.C.E., the Engineering Manager, lately made a visit to various pumping-stations and water-works belonging to the Company. At the Ryhope pumping-station, an inspection was made of the beam-engines which pump the water from a well 250 feet deep into a service reservoir of 3,500,000 gallons capacity. The North Dalton pumping-station, in course of construction, was then visited. Two wells have been sunk 240 feet deep, below which there are two 33-inch bore-holes taken to a further depth of 220 feet. The pumping machinery now being fixed (which will pump the water into the Dalton reservoir) was also inspected. A visit was then made to the Dalton and Thorpe pumping-stations.

A LOCAL TAXATION RETURN.

The Lighting and Watching Act.

THERE was issued as a Blue-Book a few days ago Part III. of the Local Taxation Returns for the financial year 1907-8, which contains abstracts of returns made by Rural District Councils, Parish Councils, Parish Meetings, Joint Committees appointed wholly by Parish Councils and Parish Meetings, and Lighting Inspectors and Committees.

At the commencement of the year beginning on April 1, 1907, there were 656 Rural District Councils in England and Wales; and their receipts (exclusive of borrowed money) amounted in the aggregate to £4,292,454. Of this, £3,006,082 was from rates, and £354,041 under the Agricultural Rates Act. From water-works, there was a revenue of £174,136; and various other items made up the balance. A sum of £276 was received from an electric lighting undertaking; and £1048 from gas-works. The total receipts, when compared with the preceding year, show an increase of £58,958. Expenditure not defrayed out of loans was £4,341,095, and included £298,299 from water-works; the total outgoings being £184,122 more than the year before. The expenditure on electric lighting (excluding cost of public electric lighting) was £1700; on gas-works, £690; on public electric lighting, £3161; on other public lighting, £20,025. Nearly 500 of the Rural District Councils incurred expenditure in respect of water supply. At the commencement of the year under review, the aggregate length of the roads under the supervision of the Rural District Councils was 101,644 miles. The receipts from loans in the year 1907-8 totalled £516,361, of which £179,924 was for water-works purposes; and the expenditure out of loans was £507,483, of which £165,278 was for water-works. The total outstanding loans on March 31, 1908, was £5,866,971; that for water-works being £1,738,140. The rates raised so as to meet the general expenses of Rural District Councils were equivalent to an average rate of 1s. in the pound on the total assessable value for these purposes. Comparing the year 1903-4 with that of 1907-8, it is seen that the total receipts (other than from loans) of Rural District Councils were greater in the latter year than in the former by nearly 5 per cent. The receipts from rates levied for general expenses show an annual decrease since 1904-5; but during the whole period of five years, the income from rates levied for special expenses exhibit a marked yearly increase. The total expenditure (other than out of borrowed money) was greater in 1907-8 than in any of the other four years; and by far the larger portion of the outlay is in respect of highways. The outstanding loans increased by 28 per cent. in the period referred to.

The total number of rural parishes in England and Wales during the year 1907-8 was 12,935, of which 7234 were entitled to Parish Councils. But only 6662 Parish Councils had financial transactions during the year; and of the Parish Meetings of the 5701 rural parishes not having Parish Councils those of only 385 had financial transactions. The number of Parish Councils having transactions under the Lighting and Watching Act (1833) was 942; the number of Parish Meetings similarly engaged was six. The total receipts under the Act were £76,121; and the expenditure, including loan charges, was £75,338. In parishes in which the Act was administered by Inspectors and Committees, sums amounting to £2706 were expended, in addition to the above-named amount. Under the Act, rates were raised for 889 Parish Councils and four Parish Meetings. The rates raised for Parish Councils were equivalent to a rate in the pound on buildings and other hereditaments not being land or tithes of 3d. or under in 552 cases, over 3d. but not more than 9d. in 331 cases, and more than 9d. in six cases. The highest were a rate of 1s. 6d. in the pound in the parish of Sandy (Beds.), and rates of 1s. in the pound raised for the expenses respectively of the Parish Councils of Potton (Beds.) and Deeping Market (Lincoln-Kesteven).

As to the accounts of Inspectors and Committees appointed to exercise the powers of Inspectors, under the Lighting and Watching Act, it may be remarked that in April, 1907, there were 21 parishes in which Lighting Inspectors were still appointed under the Act; and there were also six Joint Committees appointed under the Local Government Act of 1894 to exercise the powers of Lighting Inspectors in areas comprised in more than one rural parish. In those parishes in which the Lighting and Watching Act was administered by Inspectors and Committees, the lighting rates made during the year varied from 1½d. to 9d. in the pound. The total receipts of these Inspectors and Committees amounted to £2723, of which £2150 was from rates, and £348 from constituent authorities of Joint Committees. The expenditure came to £2706. Adding to these totals the sums received and paid under the Act during the year by Parish Councils and Parish Meetings, the total rates raised under the Act, in 917 rural parishes, during the year 1907 8, came to £76,857. The total receipts were £78,496; and the expenditure, £78,044—excluding expenditure out of loan, which was £270.

The next meeting of the Eastern Counties Gas Association is fixed for Friday week, the 23rd inst., at Cambridge. The technical matter will be the address of the President (Mr. J. W. Auchterlonie, of Cambridge), and a lecture by Mr. J. B. Peace, M.A., on "Theory and Practice in Engineering." The following morning some of the Colleges will be visited.

GAS AT THE JAPAN-BRITISH EXHIBITION.

The Gas Companies' Joint Display.—An Addition to the Exhibit.

THE GAS Companies' Joint Exhibit Committee are to be congratulated upon a very effective display that has now been added to the already attractive exhibit which is to be seen at the Japan-British Exhibition at Shepherd's Bush. A series of photographs of the original display appeared in the "JOURNAL" for June 10 (pp. 619, 620); and these we are to-day able to supplement by a view of the recently added space, which almost adjoins the other stands. This extra space was taken, it may be explained, in order that a fuller illustration might be given to the public of the domestic uses of gas. The 36 feet by 15 feet available affords an excellent opportunity for drawing the attention of visitors to the exhibition to a quantity of the larger types of gas apparatus, which could not so well be shown under the conditions previously existing; and it is found that the new stand, being quite open on two sides, enables inquiries to be put and answered very readily. It is unnecessary to enumerate here the various appliances that have in this way been added to the joint exhibit, as they are shown in the photograph. It may be mentioned, however, that they include cookers, hot-closets, carving-tables, a large quantity of laboratory apparatus, gas-fires, geysers, grillers, and cooking utensils. Wilson's new "Waldick" cooker, with a gas-fire in front, and water-heating arrangement at the side, is on view, as is also Main's gas-steaming closet; while there is a good display of different makes of cookers fitted with the new plate-rack. In fact, the show is altogether thoroughly representative; and every effort has been made not to give one make of apparatus undue preference over another The stand is efficiently lighted by six three-light New Inverted Company's lamps. Inquiry of the Superintendent elicited the fact (which we were pleased to learn) that, since this new stand has been fitted up, a very great number of inquiries have been added to the large volume already received. In fact, up to the present date, the total number of inquiries received at the Japan Exhibition has nearly reached the aggregate of those obtained during the run of the Franco-British Exhibition. The Committee may therefore fairly claim that their efforts to make a good display have been thoroughly appreciated by the public.

GAS POWER IN FACTORIES.

At last week's congress of the Textile Institute, which was held in Bradford, Mr. T. R. WOLLASTON, of Manchester, read a paper on "Gas Power and the Uses of Producer Gas in Textile Mills."

The author said that spinning and weaving mills offered an ideal load for economy, in that, while running, they were generally at full load, or they approximated to the 100 per cent. load-factor. Still, they could never show the same low total cost per unit power as, for example, steel works, flour mills, and chemical works, which ran from Monday morning until Saturday noon without a stop. The three classes of plant which had to be compared were the ordinary steam reciprocating set, the steam-turbine set, and the producer gas-engine set. The first of these had, so far as could be foreseen, reached its ultimate state of development. Unless, and until, some vital discovery was made whereby the heat which escaped in condensing water and chimney gases could be utilized, there was nothing more to be looked forward to than, perhaps, the squeezing of an extra 10 per cent. of power per unit of fuel consumption, and that probably only at the cost of such added initial outlay as would in the end nullify the advantage gained. Broadly speaking, a steam-turbine plant should cost a little less than a steam reciprocating plant, and should give almost equal efficiency. The shortcomings of the turbine as compared with the reciprocating set were the difficulty and often costliness of obtaining and maintaining the high vacuum essential for even reasonable economy, and the fact that careless management and upkeep might lead to very disastrous blade strippings, involving long and costly stoppages. In considering gas-power plants, it seemed advisable to draw a somewhat sharp dividing line between gas-engines under and over 500 H.P. The former were developed practically up to the state of reliability reached by the steam-engine. They were slightly more costly than steam-engines; but in conjunction with suction producer plants, they were often less costly than a complete steam combination. Gas-engines of over 500 H.P. were still looked upon with doubt by many, and probably justly, for builders in this country could not yet claim the wide experience which went to assure success. He was in touch with British-built gas-engines up to 1000 H.P., which were in every sense as sound and reliable as any steam-engine; and he had inspected engines of Continental manufacture up to 2500 H.P., which were similarly satisfactory. There had been much to learn, and the lesson had been the harder by reason of the prejudices set up by steam experience; but it might be said confidently that the large gas-engine problem was now solved.

Comparing gas-producer plant with boiler-house plant, he had no hesitation in stating that the pressure producer gas plant of to-day was a more satisfactory apparatus thermo-dynamically and practically than the corresponding boiler-house plant. It would work with a large range of fuels; converting a higher percentage of the possible heat units contained therein into the useful working medium. It was easier to manage, less likely to fall off in efficiency through laxity of attention, cost less during stand-by periods, was more rapidly brought to working condition after stoppage, and was usually lower in first cost. Moreover, its application dispensed with the need for any costly buildings, foundations, and chimney. Added to these was the possibility in large installations of the recovery of bye-products, which might, in favourable cases, show

such a large return that the fuel cost was absolutely wiped out, though results of this kind were not to be looked for in connection with the spinning and weaving industries under present conditions of the ten hours' working day with two intervals. Apart from the generation of power, producer gas had many applications well understood and appreciated by manufacturers in other trades, but as yet little understood in the textile industries. Its superior efficiency and economy had been proved in cloth-singeing operations and in yarn gassing. It might also be used with greater efficiency, and vastly increased economy, for heating calender bowls, and for boiling, evaporating, and concentrating processes. For drying-rooms, heating irons, and many other purposes, particularly when intermittently required or when fine temperature regulation was necessary, it was proved to be the most perfect and economical medium.

In the course of the discussion which followed the reading of the paper,

Mr. CROWLEY (Stafford) remarked that recent developments in Lancashire and Yorkshire, and also on the Continent, made it almost inevitable that electricity would be the connecting link of the future between prime mover and machine; and the steam-turbine was much more suited to the generation of electricity in the units required in the factory than the gas-engine.

Colonel H. A. FOSTER said that his firm were at present installing at their mills at Queensbury an electric drive at some distance from the main works. At first he was strongly in favour of gas; but after going into the matter very carefully, with the best expert advice obtainable, they had decided on an electric installation driven by a high-speed steam-engine working at 180 lbs. pressure, the steam from which would be afterwards available at low pressure for use in the works. A great drawback of producer plants was the polluting effluent from the gas washing. This was a matter that ought to give pause to those who recommended the general adoption of gas-engines.

Dr. ORMANDBY thought that the present wasteful way in which they were using up their national asset in the form of coal was simply ridiculous. A steam-engine had a thermal efficiency of only about 16 per cent. The thermal efficiency of a gas-engine was about 27 per cent., or two-thirds more. There was really no saving in working costs, because, though the gas-engine required less coal than the steam-engine, the coal cost four times as much. In capital charges there was a saving, because it was not necessary to build a chimney. With regard to Colonel Foster's point, the difficulty of the poisonous products from washing had been largely overcome as the result of some clever research work by Dr. Fowler, of the Manchester Corporation. Dr. Fowler had got hold of some bacteria which positively throve on these phenol compounds. When turned loose on them, they simply chewed them up; and the result was an effluent from which all the poisonous material had been removed.

Mr. WILLIAM FROST (Macclesfield) expressed the opinion that for small manufacturers employing from 50 to 100 horse power, a suction-gas engine using anthracite coal was incomparably cheaper than steam.

Mr. WOLLASTON, in replying, admitted there were immense advantages in certain cases in electrical transmission; but he did not think it came within the scope of his subject. To Mr. Crowley, who said that steam would continue to be used exclusively in central electricity generating stations, he would say, "Wait and see." It was just possible that he knew a little more of what was happening in this direction than Mr. Crowley. It was his firm conviction that before long gas plants would be put down to take the average load, and the steam plants would be used for the peak loads only. The pollution difficulty could be solved in many cases by putting down a water-cooler in conjunction with some rough process of filtration, and using the same water over and over again. Moreover, quite a number of air-cooled plants were now being put down, which used very little water indeed.

FAILURES OF GAS AND ELECTRICAL MACHINERY.

Again we have received the annual report of Mr. Michael Longridge, M.A., M.Inst.C.E., the Chief Engineer of the British Engine, Boiler, and Electrical Insurance Company, Limited. As usual, it is most instructive, to engineers generally, and particularly to mechanical engineers. Dealing first with the inspection and insurance of steam, gas, and oil engines, it is gathered that the rate of increase of this branch of the Company's business, which for several years has been a little more than 6 per cent., was reduced in 1909 by one-half. The decrease must be attributed to the deplorable state of trade. Also, there has been a reduction in proportion of steam-engines to gas-engines insured. In 1908, the proportion was 27 steam-engines to 20 gas-engines. In 1909, it was 26 steam-engines to 20 gas-engines—the same proportion as in 1907.

The rate of breakdown during 1909 among steam-engines and turbines was 1 in 10·2 of the machines insured, and among gas and oil engines 1 in 10·4—slightly lower in both cases than in 1908, but slightly higher than in 1907. The proportions in which the various parts of the insured gas and oil engines broke down in 1909 is given in the last column of the following table; the other columns giving the percentages for 1908, and the averages for the six previous years.

GAS AND OIL ENGINES.

Description of Parts which are Believed to have Given Way First.	Average Six Years to 1908.	During	
		1908.	1909.
	Per Cent.	Per Cent.	Per Cent.
Valves and valve gear	34·3	31·3	29·6
Cylinders and cylinder ends	16·1	19·4	15·4
Pistons	10·2	4·8	2·7
Connecting-rods and their bolts	10·7	10·8	9·4
Main-shafts	5·0	9·1	13·4
Governors and governor gear	4·9	4·8	5·4
Silencing-boxes and exhaust-pipes	3·9	2·4	1·3
Fly-wheels and driving drums	4·4	5·4	0·7
Clutches and couplings	2·9	0·0	0·0
Frames and pedestals	3·0	1·2	1·3
Bolts*	2·4	2·4	2·0
Total wrecks, cause not ascertained	0·8	0·0	0·0
Main driving ropes or belts	0·0	0·0	0·0
Miscellaneous	0·9	5·4	7·4
Gas-producer plants	0·5	3·0	11·4
	100·0	100·0	100·0

* These bolts do not include bolts in connecting-rods, valve-gear, and other moving parts, the bolts in these parts being included with the parts themselves.

The causes of these breakdowns may be classified as under:—

	Gas and Oil Engines. Per Cent.
Accidents and causes unascertained	34
Old defects or deterioration by wear and tear	19
Weakness, bad design, workmanship, or material	23
Negligence of owners or attendants	24
	100

It must be said that the large percentage of breakdowns from unknown causes is unsatisfactory, but difficult to alter, because so many of the gas-engines insured are small, and, on the occurrence of a breakdown, are either repaired or dismantled for repair before the inspector can examine them. The cases of weakness and bad design are also rather numerous. The weakest parts are undoubtedly the crank-shafts; as many as 13 per cent. of the breakdowns for the year being breakages of shafts. Has not the time come to build these parts instead of forging them in a single piece? That about one-fourth of the breakdowns resulted from neglect, no doubt arises from the practice of leaving small gas-engines either without skilled attendants or without attendance altogether.

Some of the breakdowns may be described; and selection is made from those referring to the breakages of crank-shafts. The first case is that of a single-cylinder horizontal gas-engine, 27 weeks old, with cylinder 24 inches diameter by 33-inch stroke, running at 146 revolutions per minute with producer gas. The crank-shaft, a mild-steel forging, was carried on three bearings; and the outer bearing, as well as the engine frame, was bolted to a massive block of concrete weighing more than 200 tons. After making about 33 million revolutions, the shaft broke one evening, without any warning, through the web of the crank next the fly-wheel, with consequential breakages of the piston, of the cap of one of the bearings, and of the engine framing, into five large pieces, besides damage to the side shaft, gas and water pipes, and other minor parts. So far as could be judged from the solidity of the foundation, and from the appearance of the shaft journals, the fracture had not resulted from inaccurate alignment of the bearings, nor from insufficient dimensions of the crank for the ordinary working pressure. In fact, there was nothing seen to which it could be attributed. It was therefore decided to analyze the material; the results of the analysis being:

Carbon, combined	0·320
Carbon, graphitic	Trace
Silicon	0·018
Sulphur	0·071
Phosphorus	0·078
Manganese	0·360

Tensile, impact, and fatigue tests were also made, with the following results:

Tensile Tests Made at the Manchester School of Technology on Standard Specimens of 2-inch Gauge Length, cut Parallel to the Crank-Arm and Perpendicular to the Axes of the Shaft and Pin.

Yield point, tons per square inch	16·8 ..	16·12
Maximum stress, tons per square inch	28·4 ..	27·92
Elongation, per cent.	21·0 ..	25·0
Reduction of area, per cent.	35·6 ..	42·2
Appearance of fracture	Silky ..	Silky

Impact Tests of Three Specimens, 2 inch by $\frac{3}{8}$ inch by $\frac{1}{16}$ inch, at Messrs. Willans and Robinson's Works.

Work absorbed, 3·2 ft.-lbs., 3·2 ft.-lbs., 2·5 ft.-lbs.
All fractures highly crystalline.

Fatigue tests, in Sankey's machine, of specimens, 4 in. long by $\frac{3}{8}$ in. diameter. Four, marked A, cut parallel to crank-arm; Two, marked B, cut parallel to axes of shaft and crank-pin.

	A.	A.	A.	A.	B.	B.
Number of bends	5 ..	3½ ..	4 ..	2½ ..	10½ ..	14½
First effort, ft.-lbs.	28 ..	28 ..	28 ..	28 ..	27 ..	31
Maximum effort, ft.-lbs.	42 ..	42 ..	43 ..	43 ..	45 ..	47½
Mean effort, ft.-lbs.	38½ ..	39 ..	37½ ..	37 ..	37 ..	40½
Work expended, ft.-lbs.	285 ..	190 ..	250 ..	180 ..	750 ..	1250
Appearance of fracture	Crystalline ..				Silky	

A decent 0·32 carbon steel should have a yield stress approaching 20 tons, and an elongation of about 23 per cent. in 8 inches, should absorb 15 or 16 ft.-lbs. under impact test, and about 2000 ft.-lbs. under fatigue test. The mechanical tests show that the steel from which the broken shaft was made was brittle; and the analysis why it was so. The flaw, if there was one, may be attributed to the high percentage of sulphur, and the early breakage to the phosphorus.

It is possible that failure may have been hastened by premature ignitions (though the owner of the engine denied that these had occurred), for the exhaust-valve had been left without examination from the time the engine started, on Aug. 22, 1908, until Feb. 22, 1909, a fortnight before the breakdown; and when taken out on the last-mentioned date it was found to be full of deposit internally, and burnt and corroded externally. The main cause of the failure, however, was the inferior quality of the shaft. The maximum load on the crank-pin was about 130,000 lbs.; and the weight of the fly-wheel about 21,000 lbs. Assuming the pressure on the bearing between the crank and fly-wheel to act at the middle of the bearing, the bending stress on the crank would be about 8900 lbs. per square inch.

Take another instance—a horizontal gas-engine, barely twelve months old, with cylinder 16 inches diameter by 21-inch stroke, running at 175 to 180 revolutions per minute with producer gas. The crank-shaft was a mild-steel forging. It was held in two bearings, and carried two fly-wheels 6 ft. 10 in. outside diameter, each weighing about 4000 lbs. One of the cranks failed in the web after the engine had made about 50 million revolutions, and about 18 million explosion strokes. The maximum load on the crank-pin was about 54,000 lbs., and the pressure on the bearing next to the fractured crank was about 27,400 lbs. Assuming this reaction to act through the middle of the bearing, the bending stress on the crank would be about 6500 lbs. per square inch. There would also be some slight additional stress from the torsion of the right-hand fly-wheel; but anyhow the stress on the slab was low.

Test-pieces, 2in. by $\frac{3}{8}$in. by $\frac{3}{16}$in. 4in. by $\frac{3}{8}$in. diameter, were cut from the broken crank for impact and fatigue tests, some (A) parallel to the crank-arm, others (B) parallel to the axes of the shaft and crank-pin, and were tested with the following results:

	A.	A.	B.	B.
Impact tests—				
Work absorbed in breaking, ft.-lbs.	5·2	4·75	10·2	10·2
Fatigue tests—				
Number of bends	7¾	7¾	17¾	17¾
First effort ft.-lbs.	30	31	30	32
Maximum effort ,,	44	49	53	50
Mean effort ,,	40·5	44·5	46·0	44·5
Work expended ,,	615	720	1710	1750

The steel was also analyzed, and found to contain:—

Carbon	0·209
Silicon	0·081
Manganese	0·603
Sulphur	0·020
Phosphorus	0·038

No static tensile test was made; but from the analysis, it may be assumed that such a test would have shown a proportional limit of about 14 tons, a yield point at about 17 tons per square inch, an elongation of about 27 per cent. in 8 inches, and a maximum resistance of about 30 tons per square inch.

Unfortunately, the percentage of nitrogen was not determined by the analyst; and it is possible it may have been sufficient to cause the brittleness to which the fracture must be attributed. Otherwise, there is no indication of any defect in the material. Nor was there any excessive stress set up by centrifugal forces resulting from the revolution of unbalanced weights in the fly-wheels; for the Company's inspector tested both wheels upon a mandrel, and found they were amply strong enough to stand in any position.

Another somewhat similar fracture had illustration two months ater. In this instance, the engine had a cylinder 11 inches diameter by 18½-inch stroke, and ran at about 145 revolutions per minute, making, on an average, 32 explosions per minute. The crank-shaft had two bearings and two fly-wheels, each weighing about 1800 lbs. This shaft was put in new in January, 1907, and was fractured on June 29, 1909, through the crank-web nearer the driving pulley, after having worked for 5180 hours, during which it had made about 45 million revolutions, and suffered the stresses from about 10 million explosions, giving a pressure of about 350 lbs. per square inch on the piston. The stress on the crank-web would be about 12,800 lbs. per square inch.

After the breakdown, instructions were given for the preparation of test-pieces for impact and fatigue tests. These were to have been cut, as in the other case, parallel to the crank-arm and parallel to the axis of the shaft; but by some mistake all the specimens for the impact tests were cut parallel to the axis of the shaft—A with the broad sides ($\frac{3}{8}$-inch wide) and B with the narrow sides ($\frac{3}{16}$-inch wide) facing the edge of the crank. Fortunately, however, the Company obtained three more specimens (C) cut, as B ought to have been cut, parallel to the crank-arm. The fatigue test-pieces D were cut with their axes parallel to the crank-arm; but the piece E (which should have had its axis parallel to the axis of the shaft) was cut with its longest dimension perpendicular to this axis and to the crank-arm. The results of the tests were these:—

	A	A	A	B	B	B	C	C	C
Impacts tests—									
Work absorbed in breaking, ft.-lbs.	9·5	10·1	8·2	9·4	10·5	10·6	5 0	5·4	6·8
Means ,,			9·7					5·7	
			D		D			E	
Fatigue tests—									
Number of bends			7½		7½			6¾	
First effort ft.-lbs.			29		28			38	
Maximum effort ,,			55		53			50	
Mean effort ,,			45·6		49·6			48·4	
Work expended ,,			785		700			715	

Neither static tensile test nor analysis was made, nor was the cause of the fracture suggested by anything in the construction or working of the engine.

The impact and fatigue tests in this and the previous examples are suggestive. They all show the low capacity for withstanding impact and fatigue of the pieces cut with their longest dimensions perpendicular to the axis of the shaft, and especially of those cut with their longest dimensions parallel to the crank-arms. They suggest that crank-arms proportioned on the assumption that the material in them is as strong as in the bodies of the shafts forged with them are in reality much weaker than the shafts, because the material in them has not the same capacity for resisting the stresses which come upon it as has the material in the shaft to resist the stresses which come upon it. In other words, if a unit stress of 8000 lbs. to 9000 lbs. be permissible upon necks and crank-pins of forged crank shafts, the unit stresses on the crank-arms should not exceed 4000 lbs. to 4500 lbs. per square inch. If this be true, then these two last-mentioned breakdowns may be ascribed to weakness; and as the dimensions of the crank-arms were not unusually small in relation to the cylinder dimensions, it follows that most crank-arms are weak, and that they ought to be strengthened or forged separately, and shrunk or forced on to the shafts and crank-pins.

A further case is a horizontal gas-engine, some seven years old, working with gas from a town main. The cylinder was 11½ inches diameter by 24-inch stroke; the speed, 220 revolutions per minute; the number of explosions per minute varying from 50 to 90, but generally between 70 and 80; and the average of explosions recorded at the inspector's visits, 71 per minute.

The crank-shaft had three bearings, 5⅛ inches diameter by 10⅜ inches in length; and a crank-pin 6¼ inches diameter. The weight of the wheel was about 5000 lbs. The engine was set on wedges on a concrete seat; the space between the top of the seat and the under-side of the bed-plate being grouted with fine concrete. In November, 1907, the grouting had become softened with oil; and the middle bearing of the shaft was found to be too low. In December, the bearings were adjusted. In November, 1908, the middle bearing again ceased to support the shaft, and the outer bearing ran warm. The old grouting under the bed-plate was then picked out, and replaced by good folding wedges and fresh grouting. The shaft was lifted, and the bearings all properly levelled. In November, 1909, the shaft broke at the junction of the crank-pin with the crank next the fly-wheel. The stress upon the pin, supposing all the bearings to be in line, would be about 7200 lbs. per square inch—a stress unusually low in gas-engine practice. The result was that, notwithstanding the failure of the foundation in 1907, the shaft made 250 million revolutions, and probably bore about 80 million explosion stresses before it broke. Had the engine been properly seated, no doubt the life of the shaft would have been longer; but for a gas-engine shaft it was not bad.

As a final example, reference may be made to a horizontal gas-engine, six years old, with cylinder 20 inches diameter by 30-inch stroke, connected by flexible coupling to the shaft of a dynamo running at 180 revolutions per minute. In 1906 the shaft broke, and was replaced by a new one. Soon after starting, one morning in October, 1909, the bearing next the fly-wheel began to heat; and the attendant was compelled to stop the engine. When the cap was lifted, a crack was found running into the crank-web along the neck, and then circumferentially round it—the total length being about 9 inches. The engine was supplied with suction gas, giving a maximum pressure of about 340 lbs. per square inch upon the piston, and a load of about 94,000 lbs. upon the crank-pin when the crank was on the inner centre, a load of 87,600 lbs. when the tangential pressure on the crank-pin was a maximum, and a maximum tangential load of 45,000 lbs. The maximum stress calculated for these loads would be somewhere about 18,000 lbs. per square inch. The life of the shaft was about 91 million revolutions. The number of explosions per minute could not be ascertained; but assuming it to be 80 per cent. of the possible mean, it would be 18 millions.

Fatigue tests of pieces A, cut parallel to the crank-arm, and B, perpendicular to the crank-arm and to the axis of the shaft, gave:

	A_1.	A_2.	B_1.	B_2.
Number of bends	14·5	14·5	16·5	19
First effort, ft.-lbs.	29	30	27	?
Maximum effort, ft.-lbs.	52	52	57	?
Mean effort, ft.-lbs.	46·5	46	46·5	?
Work expended in breaking, ft.-lbs.	1380	1320	1550	1755

The composition of the material was found to be:

Carbon	0·300
Silicon	0·074
Manganese	0·780
Sulphur	0·035
Phosphorus	0·740
Nitrogen	0·006

Turning to the section of the report alluding to the inspection and insurance of electrical machinery, it is found that in this branch of the Company's business also the rate of increase has been affected by the state of trade. It is lower than in 1908; but the rate of increase in the number of breakdowns has fortunately been lower still. Indeed, the breakdowns of dynamos were absolutely fewer than the previous year. The cost of repairing the damage done, except in the case of starting switches and controllers, was also less; so that, on the whole, the benefit of inspection to the insurer as well as the profit to the Company has been greater. The rates of breakdown among the various classes of machines were: Dynamos, continuous current, 1 in 17·2; alternating current, 1 in 17·5. Motors, continuous current, 1 in 8·2; alternating current, 1 in 9·5. Dynamos and motors, continuous current, 1 in 9; alternating current, 1 in 9·7. Starters and controllers, 1 in 25.

The causes of the year's breakdowns were probably these:

Cause of Damage.	Dynamos.			Motors.			Starting Switches and Controllers.		
	Average for Seven Years previous to 1908.	1908.	1909.	Average for Seven Years previous to 1908.	1908.	1909.	Average for Three Years previous to 1908.	1908.	1909.
Accidental	11·6	6	5	8·4	4	2	15·6	8	5
Dirt and neglect	18 2	23	20	20·8	30	26	11·0	17	19
Age and deterioration	24·1	25	16	23·1	20	14	26·0	25	17
Bad work or design	20·4	20	23	16·1	11	14	7·7	9	14
Overloading	2·5	0	1	5·0	1	1	5·7	2	2
Unascertained	23·2	26	35	26·6	34	43	34·0	39	43
	100·0	100	100	100·0	100	100	100·0	100	100

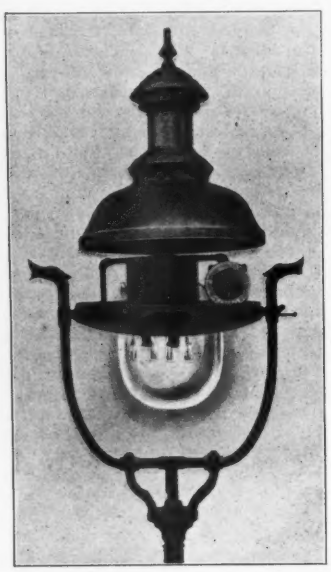
Some examples of breakdowns are quoted; and before closing this section of the report, Mr. Longridge considered it well—in view of the number of men who have been killed or have received severe shocks recently by touching high-tension machinery—to remind all who have to clean or inspect such machinery that, when well insulated, and endowed with large electrostatic capacity, it will conserve a charge for an appreciable, and sometimes for a considerable, time after the current has been cut off. No one should, therefore, attempt to handle any part until he has satisfied himself that it has been completely disconnected from the source of supply, and that a sufficient time—say ten minutes—has elapsed after the disconnection to allow the electrical charge to leak away. The stators of large high-tension alternators may possibly remain charged for still longer periods; and therefore, even after the lapse of whatever time may be considered sufficient for discharge, the part, before being handled, should be touched lightly and quickly with the finger. Indeed, this preliminary touch is always wise. Long cables, armoured or buried underground or immersed in water, may, under certain conditions, hold charges for hours, and should never be handled by those who do not understand the conditions under which they become condensers, and the proper methods of discharging them.

The Leicester Appointment.

At a meeting of the Leicester Gas Committee, held on Monday of last week, under the presidency of Alderman T. Smith, it was decided to recommend the Town Council to confirm the appointment of Mr. Hubert Pooley, of Stafford, to the position of Engineer and Manager of the Leicester gas undertaking, in succession to the late Mr. Alfred Colson. The salary will be £800 a year, rising by annual increments of £100 to £1000, on giving satisfaction to the Committee. The appointment was made from a list of five selected candidates. Mr. Pooley has been the Stafford Corporation Gas and Electrical Engineer and Manager since 1900. During his term of work there, very important alterations have been made to the works, designed by Mr. Pooley, under whose supervision the undertaking generally has been most successful. He is a son of the late Mr. Henry Pooley, J.P., for many years senior partner in the firm of Henry Pooley and Sons, the weighing machine makers. He is a cousin of Mr. J. A. Picton, one of the Members of Parliament for Leicester from 1884 to 1892. He was trained in the office of his father's firm. Afterwards he was a student at the University College, Liverpool, studying chemistry and engineering. On the completion of his studies, he was articled to Mr. T. O. Paterson, the Birkenhead Corporation Gas Engineer, whom he assisted in carrying through some extensive alterations. In 1893, he was appointed Engineer and Manager to the Dunfermline Gas-Works, which were taken over by the Corporation in 1896. While there, he was elected President of the North British Association of Gas Managers. He went from Dunfermline to Stafford. Mr. Pooley was President of the Midland Association of Gas Managers in 1907.

"BAMAG" DISTANCE PRESSURE-LIGHTERS.

With electric illumination, it is possible to light all lamps from a central station. This arrangement offers the advantage that the lights can be turned on or off in the street lamps without any special attendance, independent of existing lighting schedules, without any preparation whatsoever, and can always be accomplished to suit real and actual requirements. This advantage had to be transferred to gas, in order to enable it to permanently maintain its acquired position as a popular illuminant in competition with its rival, electricity. To light and extinguish street gas-lamps from a central station has been the object and aim of several arrangements for some years past, such as distance lighters operated by compressed air, by electricity, by clockwork, and by gas pressure. Distance lighters for street lamps,



"Bamag" Distance Lighter for Inverted Street Lighting.
[Head of Lamp Raised.]

actuated by air pressure or by electricity, have not met with very much success, as the expenses connected therewith were too high, while gas-pressure distance lighters have become a favoured medium.

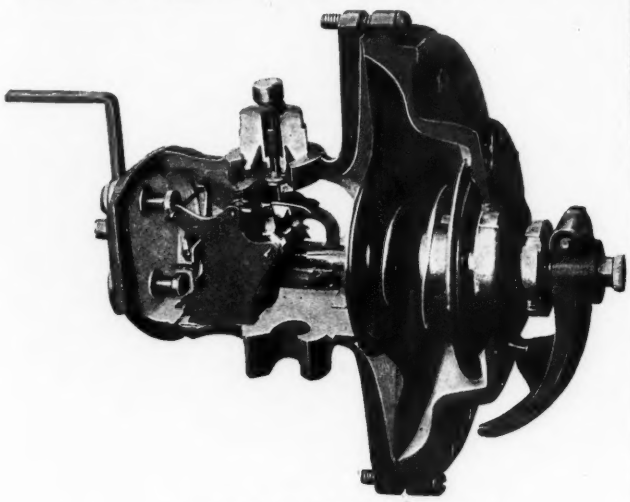
The first experiments, about nine years ago, in utilizing gas pressure for operating distance lighters by a pressure wave (a temporary increase of pressure over the normal pressure), have shown that such a pressure wave can be transferred through the

Head of Lamp Closed, and "Bamag" Lighter Hidden.

whole system of mains with astonishing velocity, even to the remotest outskirts, and to any distance. Therefore, a wave of a certain height is sufficient to operate all the street lamps of a town simultaneously, provided that, at the time of the wave being given, the mains are not over-loaded, or that inadequately sized

mains do not stem the progress of the pressure wave. Experiments to produce distance lighters operated by a pressure wave led to the making of two distinct kinds—one with a diaphragm, and another with a float or cup, on which a wave can exert its force. The first prolonged trials (the Distance Lighting Company claim) proved at once the superiority of the diaphragm.

The first distance lighter on the diaphragm principle which has come into extensive use is the "Bamag." The numerous, and many years old, installations of this apparatus have conclusively proved that gas and its impurities have no deleterious influence on the diaphragm. They have proved, too, that it is the correct thing to dispose all movable parts within the strong shell of the apparatus, which protects them from any wilful damage. At first it was feared that accumulation of gas impurities and corrosion would affect the parts disposed in the gas space. But this has not been the case, as the absence of oxygen excludes corrosion. The movable parts disposed outside the gas space will be much more readily clogged, corroded, and damaged, on account of the



Section of the "Bamag" Apparatus.

ever-changing moisture and temperature of the atmosphere, dust, and other deleterious influences, than will be the case with the internally-disposed movable parts of the "Bamag." Consequently, we learn that an unlimited guarantee can be given as to the performance and life of the "Bamag" apparatus.

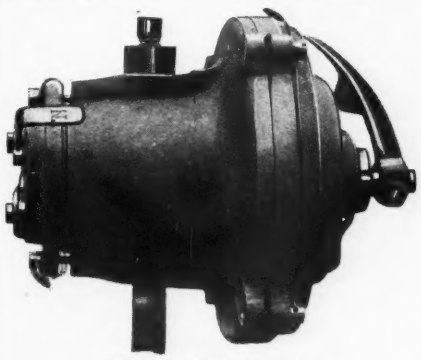
The diaphragm is the most important part of the apparatus. It only moves within the limits of its greatest force development; and an air-cushion, provided also within the shell of the apparatus, regulates the movement of the diaphragm. Sudden, unexpected pressures from within, as well as from without, have no effect on it. The employment of a valve to control the gas-way in the "Bamag" lighter is sufficient for the intended purpose, while its mobility is independent of temperatures and all other influences. Besides, a valve requires the least possible power for movement, which enables the "Bamag" apparatus to work with only a small pressure wave.

It is of the utmost importance that a distance lighter should allow of speedy fixing, and also of equally speedy change, if alterations in working pressures are made. To achieve this, the "Bamag" apparatus is provided with a pointer, movable in front of a dial, which permits of easy and instantaneous adjustment to any desirable gas pressure. The pointer at the same time serves to take pressures in the lamps; for, by moving the pointer in a certain direction, the gas is ignited. The point of ignition shows the actual pressure in the lamp service-pipe at the moment the pressure is taken; and it can be read off directly below the pointer. By fixing the pointer on a correspondingly higher point, correct adjustment of the "Bamag" is complete. This shows clearly how readily and quickly a "Bamag" lighter can be adjusted, even under the most difficult pressure conditions.

Back View of the Apparatus.

This pressure lighter, besides being operated by a pressure wave, can also be operated by hand, inside the lamp by means of a lever, or else from the outside by a lever with rod. The apparatus is constructed to suit all kinds of lamps, with upright or inverted burners, and for high-pressure gas lighting. The simple construction of the working parts indeed allows of manifold applications; so that the apparatus can work with two, three, four, and more pressure waves in 24 hours. This makes it possible, for instance, to light all lamps or burners at dusk, extinguish part of the lamps (say) at 11 p.m., another part at midnight, and the remainder at dawn. Or part of the lamps can be relit during the night as required—say, after the electric lights are extinguished—or for a few hours in the morning when men are going to their day's work.

The gas industry has opened a new field for itself by adopting distance lighting plant. The plant supplies gas by pressure from the gas-works to a distant district, small town, or village, which is provided (say) with lamps fitted with "Bamag" distance lighters. In conjunction with such an installation, gas pressure lighting reaches a point of additional interest; for, by the special construction of the supplementary plant used, the actuating of the "Bamag" distance lighters in the most remote districts can be made quite independent of the other districts of the central gas-works, and the waves can moreover be given at any desired time, and in any desired manner or rotation.



Side View of the Apparatus.

The great advantage of the "Bamag" distance lighters, coupled with the possibility of using them under all conditions, and under the most difficult pressure occurences, have greatly favoured their adoption; so that at the present time, we understand, more than 63,000 are in operation in Germany alone. Should unfavourable conditions—insufficiently large mains, &c.—not admit of the use of distance lighters without certain alterations, it may be taken for granted, and with absolute certainty, that the mains kept under normal pressure at the governor, do not satisfy all the requirements of consumers. It is a friendly warning to the managements of gas undertakings that they should subject their mains to inspection and improvement, if waves of sufficient height cannot be satisfactorily transmitted from the gas-works. In such cases, it is in the interests of the gas-works to increase their mains with a double object—to satisfy their customers, and to give as much gas as possible under suitable pressure. Finally, gas pressure distance lighting forms on its own accord a continual supervision, indicating, whether in the mains, and at which points, alterations or improvements are required.

The great range of the apparatus in meeting variation in pressure and requirements, and the certainty in complying with the designed purpose in operation under numerous different conditions, have been demonstrated to us by Mr. Maurice Schwab, at the office of the Distance Lighting Company, No. 69, Farringdon Road, where anyone interested can also have a like interesting experience.

The foregoing general reference to the "Bamag" gas-pressure distance lighters may be supplemented by extracts from reports on the subject that have recently appeared in the "Journal für Gasbeleuchtung," and contributed by Herr F. Göhrum, of Stuttgart, and Herr H. Dobert.

From the Report by Herr Göhrum.

As the lighting requirements of our streets increased, proposals came forward to decrease the cost of expenses. Lighting and extinguishing play a prominent part in this, so that a reduction of cost in these, by the use of seemingly suitable appliances, appeared to be the first consideration. The appliances coming into question, can be divided into three groups:

(1) Apparatus with clockwork which operates the opening and closing of the lamp-cocks. Each lamp possesses one apparatus, independent of all the other lamps.

(2) Apparatus operated by electric current. Such apparatus is operated according to the arrangement of the electric wire system, simultaneously in the whole district, or in groups only. It allows actuation of the street lighting, corresponding to the commencement or the end of the lighting requirements—the commencement of dusk and the beginning of dawn.

(3) Apparatus which actuates the lamp-cocks at the time of lighting or extinguishing, by means of different gas pressures in the mains. Such apparatus operates simultaneously all through the district; allows the actuating of the lamps at the beginning of dusk and of dawn.

An appliance which meets all demands, must comply with the following conditions: (1) It must be absolutely reliable. (2) It must allow the possibility of lighting and extinguishing as and when required. (3) It must in no way influence the lighting in private houses. (4) It must not cause unproportionally great outlays. None of the foregoing three systems answers completely these demands; but it may be stated that the clockwork apparatus

is a quite useful medium, and in many cases will be the only system which can be adopted. After it was recognized that the existing lighting appliances did not come up to the ideal of central lighting, we reverted to the system of pressure waves, which, if my memory does not fail, was first used by Professor Klinkerfuss, of Göttingen. This system has been recently worked out and improved in divers forms. It is intended to communicate the advantages of technical and economical nature which have been obtained in Stuttgart during the past half year with about 4200 distance lighters. It may be shortly stated that the installation of so great a number of lamps with "Bamag" lighters was decided upon after a small number of the same apparatus had been tried experimentally for two years, at a great many divers points of our mains, and after the suitability of the apparatus had been verified both in horizontal and vertical positions. It may be further stated that of the 4200 "Bamag" lighters only few, if any, miss per day; and here it may be remarked that a number of service-pipes have frequently water lodged in them, which may account for the failures.

The technical advantages of the distance lighters are: (1) The possibility of lighting or extinguishing the whole of the lamps in the space of one minute, and that, too, at any desired moment; so that the street lighting can be made to fit the requirements as close as possible. (2) The possibility of lighting the lamps should darkness set in exceptionally early, without waiting for the arrival of the lamplighters, which varies according to a fixed lighting schedule. Through abnormal, unforeseen weather conditions, the street traffic increases; so that absence of illumination is felt doubly disagreeable. (3) The possibility in case of floods (which occur here frequently), in low-lying districts, to operate the lamps without any trouble. (4) In the fact that an absolutely reliable attendance to public lighting is no longer dependent on the certainty or uncertainty of the lamplighters. (5) In the quiet and easy lighting or extinguishing of the lamps, as the pushing, pulling, or knocking with the torch on the lamp-cocks is avoided; and consequently the vibration of the whole lamp does not exist, and the ignition of the gas takes place without any explosion. The mantles and chimneys of the burners are not ill-used, and they last longer. There is, in our own case, a reduction in the number of mantles from Dec. 1 until March 31, as compared with the same period of the preceding year when the lamps were operated by hand, from 9900 to 5500; and in the same period breakages of the chimneys were reduced from 4100 to less than 600. This shows clearly how maintenance has been simplified by the introduction of distance lighting. (6) In the fact that a smaller number of men, but more qualified, are required for attendance and maintenance of street lighting. This removes all unpleasantness appertaining to the employment of a large staff recruited from all ranks, and as a rule not over-intelligent. (7) An additional fact may here be mentioned, which, it may be said, is indirectly useful. With the introduction of distance lighters in the whole of the lamps, the entire mains are, as regards pressure conditions, under lasting observation; so that, if necessary, improvements in these conditions can be carried out before the consumer suffers through insufficient supply.

The foregoing enumerated technical advantages produce very economical results; and the economical advantages of distance lighting can be tabulated in figures:

(1) Saving in gas from Dec. 1 to March 31, compared with the consumption in the same period of the previous year, in consequence of lighting and extinguishing to meet actual requirements, 14,000 c.m. (495,000 cubic feet).

(2) The number of mantles used in the four months was 5508, as against 9912 in the same time the year before, which equals a saving of 4404 mantles. It may be mentioned that the mantles employed from Dec. 1, 1909, to March 31, 1910, were considerably less durable.

(3) The number of chimneys used in the four months was 578, against 4128 during the same period the previous year, corresponding to a saving of 3550 chimneys.

(4) Expenditure in wages for maintenance and attendance on the lamps in the four months was £212, as against £1064 10s. for the same period of the preceding year, and that is for the whole street lighting of the town of Stuttgart. This shows a saving of £852 10s., which sum would have been increased by £105 if, at the time, the whole of the lamps had been fitted with distance lighters. This will be realized in the course of this summer, when all the district governors will have been reconstructed in such a way as to allow the pressure wave to pass through into every district.

Expressed in money, we have the following result for the period, as against the corresponding months of the preceding year:—

Saving in gas, 14,000 c.m. (497,730 cubic feet) at 10 pf. (2s. 9½d. per 1000 cubic feet)	£70 10
Saving in mantles, 4400 at 20 pf. (2·4d.)	44 0
Saving in chimneys, 3500 at 12 pf. (1·44d.)	21 0
Saving in wages	850 0
Total saving in four months	£985 10
From this must be deducted gas burned in the bye-passes, 26,400 c.m. at 10 pf.	132 0
Leaving a net saving of	£853 10

We may therefore calculate with certainty on an annual decrease of cost for street lighting of £1250, in consequence of the installation of 4200 "Bamag" lighters. By the introduction of distance lighting, not only a saving in the cost of street lighting is achieved, but an installation of public lighting is obtained which does not lag behind the electric light.

[Since the above was written, Cannstadt (a suburb of Stuttgart) has been supplied with an additional 1500 "Bamags."]

From the Report by Herr H. Dobert.

After five years' use of distance lighting apparatus, and the lighting and extinguishing of the whole of the lamps of my town having been done by these appliances for more than two years, I am in a position to reply to the question whether the advantages expected from the installation are actually gained.

By the use of distance pressure lighters, the lighting and extinguishing of all the lamps is performed by one man only, at the gas-works, by means of pressure given by the governor, at the moment when dusk sets in in the evening, and with the break of dawn in the morning. The giving of pressure waves is shown in all gas-works pressure recorder diagrams; and this record will present an absolutely correct picture of the actual number of hours all lamps have been alight. In a paper read by me in 1908, I showed (by graphic illustration) how irregular darkness sets in in the evening, according to prevailing weather. Very seldom the time remains the same for several succeeding days—differences from five to fifteen minutes occur nearly daily, and sometimes they reach fully thirty minutes. The deviation from the normal lighting time schedule is still greater, as the time when lighting becomes desirable can be judged in all weathers. During the winter months, with few exceptions, we could light up about half an hour later than is prescribed in the lamp time table, but in the light summer months lighting took place on many days three-quarters to one hour later. As these differences also exist in the mornings when darkness fades, with a little attention the burning hours per annum can be materially reduced in the evening and all-night lanterns. When tending lamps by lamplighters, no notice can be taken of bright weather, as lighting and extinguishing have to be performed according to the schedule.

The average consumption of gas per lamp per hour, taken at 4 cubic feet, means a consumption of 2000 cubic feet in 500 lamps per hour. Therefore every minute which can be saved of the time of burning in bright weather means a saving of 35·3 cubic feet in 500 lamps. According to my statistics, the actual burning hours for evening lamps have been reduced by 135 through the distance lighting apparatus. This means for the 500 burners a saving in gas for 135 hours of 8000 cubic metres. For all-night lamps also, a reduction of burning hours occurs; but the lamps being less in number, the saving probably is 2000 cubic metres. The saving in gas for 500 lamps in one year is, therefore, 10,000 cubic metres, or per lamp per annum, 20 cubic metres.

To this has to be added the saving effected by the simultaneous extinguishing of the evening lamps as well as the all-night lamps. It is not possible to estimate this by calculation. Immediately after the installation of the distance lighters, leakage was reduced by 2 per cent., which admits of the conclusion that, by the regular extinguishing of evening lamps at the same hour, a greater saving in gas is effected than was fixed by calculation for the lighting of the evening lamps. Taking one-half of the gas saving accrued by the reduction of leakage to the credit of the distance lighters, it means, for the conditions prevailing in my town, a saving of 17 cubic metres per lamp per annum. It would not be estimating too high to take the annual saving of gas for each lamp as being 35 cubic metres.

In order to ascertain the saving in wages, I calculate the average number of lamps tended by one man to be 60 to 65. Thus 500 lamps require eight lamplighters. Under the assumption that the men also clean the lamps, their average earning per year will be £30. An inspector for maintenance of lamps, mantles, and burners is required whether the lighting is done by hand or automatically. For cleaning 500 lamps, two cleaners will be wanted. They can clean 20 to 22 lamps thoroughly per day; so that every lamp receives proper attention once a fortnight.

Dispensed (with automatic lighters for 500 lamps) with eight lamp lighters, having an average yearly wage of M. 600	M. 4800
Required two lamp cleaners with an average annual wage of M. 1200	2400
Saving in wages in favour of distance lighters	M. 2400
Or per lamp per annum	480

With proper care of the distance lighters, the economical advantages, in reference to saving in gas and wages, stand thus:

Gas, saving per lamp per annum 35 c.m. at 11 pf.	M. 3·85
Wages, " " " "	4·80
Single light, per lamp, per annum, total saving	M. 8·65
Double " " " "	12·25

Should at any time a burner with lighted bye-pass refuse to light, it is a positive sign that the fault lies in the main—either a stoppage or a leak which has weakened the pressure wave. The distance lighters assist greatly in tracing defects in mains. They enable one to verify the pressure conditions in the mains, as by moving the pointer on the face of the dial, the existing pressure can be ascertained at a glance. It is consequently quite a simple matter to find and remove any fault in the main, when unduly low pressure is observed in any district, caused by inadequate connections or throttled pipes.

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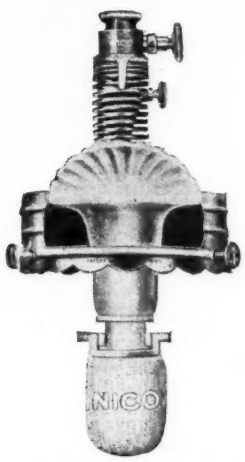
"NICO-VIBRA" BURNER & "NICO-RADIO" LAMP.

THE New Inverted Incandescent Gas-Lamp Company, Limited, of Farringdon Avenue, have always, as the records of the "JOURNAL" show, had a keen eye for novelties in connection with inverted gas-burner lighting. Pioneers in inverted gas lighting in this country, their acuteness in this respect is quite in accordance with the fitness of things, and with what one would expect from a Company that showed such perseverance as this one did in the early days of a revolutionary system of lighting. Honour to whom honour is due. We say, and we say it without fear of contradiction, that, had it not been for the tenacity of the Company to their belief in the possibilities of the inverted burner in the days when the burners came to us in their crude state, and for their painstaking work in discovering the necessary refinements conducing to perfection, the inverted burner would not have occupied the position in popularity and in the economy of lighting that it does to-day. The spade-work was theirs. As we look to-day on the latest burner that the Company have introduced to our notice under the name of the "Nico-Vibra," giving a steady and intense light with an economical consumption of gas, thoughts revert to the first public exhibition by them of inverted burners at the Crystal Palace in 1901, with their wobbling, noisy flames, and a tantalizing propensity to light-back. Then people said—the expert gas man among them—that the burner was a contravention of the natural order of the combustion of gas, and would never succeed. What of the prophecy now? The inverted burner to-day stands at the very apex of the economy and efficiency of incandescent lighting.



The New "Nico-Vibra" Inverted Burner.

In their work of improvement, and in introducing improvement, the Company have not—either in the domestic or outdoor forms of lamp—adopted any conservative attitude, or turned from their doors, without thorough examination, any new ideas emanating from outside sources; and in this regard, they are not, even with the efficiencies of their own "Nico" type of burner, departing from established policy. The newest burner—the "Nico-Vibra"—that they have added to the range already possessed is proof. It is the invention of Signor Amedeo Giorgi, Gas Engineer, of Florence; and the patent rights have been acquired by the Company. It is the most novel inverted burner that we have yet seen; and as its name implies, in its structure is an anti-vibrating arrangement, forming an inseparable part. It looks curious. Presented to the eye we have, in place of the ordinary bunsen tube, a strong spiral spring. Fitted at the top of this is the gas nipple and regulator. This feeds into an altogether separate part in the form of a funnel; and this funnel works up and down as required in a short bottom length of tube, with a bell-mouth. We need not here refer to the gas regulator and nipple; the combination is of the well-known "Nico" type. The funnel plays an important part in the supply of air for the mixture. It produces as it were a dual supply of air at different stages of the flow down what, falling a better name, must be termed the bunsen. At the top of the funnel, is the primary air supply; and at the bottom a secondary air supply. Owing to the cone shape of the funnel, the turning down or up (by means of the projecting piece working in the spiral spring) effects the proportioning—by the reduction or enlargement of the annular space—of the air supply to a nicety for any grade of gas that is being supplied; so that it is adjustable to suit practically any condition of gas supply. To say the least, it has a magnificent range of both air and gas adjustment. The proof of the advantage in the construction, and in the admission of a primary and secondary air supply, is found in the production of a noiseless and high-temperature flame under varying conditions. The spiral spring (which is made of hardened steel wire, and so must have a longevity of a no mean order) not only acts as an excellent vibrator, but it also serves as a radiator for the heat generated by the burner; and consequently through it, and the construction of the crown of the burner, the fitting to which the burner is attached is kept comparatively cool. This was tested after a burner had been in use some time, by toying with the gas adjustment without any inconvenience in the way of burning the fingers. Thus regulation can be effected at any time the burner is in use. But just a few words as to the lower part of the burner. It is made of a white china cone, with a deflecting head attached in one piece, and an outlet is provided in one direction only by an opening (as illustrated) in the globe supporting band. The protective power of the burner is obvious.

The burner (which is finished in polished brass, steel bronze, or red bronze) is at present made in the standard large and medium sizes; and so it takes the standard sizes of globes and mantles. Reference has been made to the anti-vibratory action of the spring. Its flexibility is noteworthy; and subjecting it to vibration tests, it was observed that, though the burner was almost swinging, the flame and the incandescence of the mantle were not interfered with. From this it will be seen there is for the burner, in addition to domestic and shop lighting, the large field presented by factories, mills, railway stations, and other places where work and traffic produce considerable tremours. It is notorious, too, that the inverted mantle possesses longer life than the vertical form; and the "Nico-Vibra" will extend the life, and thus add to economy. The burner is altogether good looking; and it has the well-finished appearance that speaks of good workmanship and strength.

Regarding the consumption and the efficiency of the burner, the one is low, the other is high. Photometrical tests show that the standard large size burner gives an illuminating power of 100 candles with a consumption of only $3\frac{1}{2}$ cubic feet of gas an hour; while the medium sized burner, with a consumption of $2\frac{1}{4}$ cubic feet per hour, gives a duty of 65 candles—being equivalent in both cases to an efficiency of about 29 candles per cubic foot of gas consumed. We still progress in low-pressure lighting.

The Company are also putting on the market this season a highly efficient outside gas-lamp under the name of the "Nico-Radio," which title again is expressive of characteristics. The lamp is made either with an enamelled steel, or a strong copper, casing. It is of the self-intensifying form, fitted with inner glass chimneys. The burners are of a special type, with external gas and air regulation. Each burner consumes about 4 cubic feet of gas an hour, giving an illuminating power of 125 candles; and

The "Nico-Radio" Lamp.

this duty can be multiplied by the number of burners with which the lamp is fitted. The lamp is furnished with a flash bye-pass; and this, being below the mantles, is not affected by the heat or by carbonization. The construction of the lamp renders it perfectly wind and rain proof; and from all points of view, it is an excellent lamp for maintenance purposes. When used for shop window lighting, a parabolic reflector, instead of a flat one, can be supplied, if desired.

Some of the firm's customers have a particular liking for the "Nico" inverted mantles; and there has been request for the same mantles in the upright form. The Company, nothing loth to extend business in any legitimate direction, have complied with the desire, and are now making a speciality of strong loom-woven types of upright mantles.

This reference to the New Inverted Company's latest special productions may be concluded with a brief allusion to their new catalogue. We venture to say that this is the most comprehensive and extensively illustrated catalogue they have ever issued. It is expressive of the magnitude of the inverted lamp and burner business to-day. Illustrated are an excellent range of "Nico" gas-burners, an abundant design of fittings from the plain to the highly ornate in all the finishes complying with the current demand, numerous accessories, and glassware of all styles. Concerning the fittings, the patterns are the Company's own, and are made at their works at Birmingham. Some of them are most artistic; and being manufactured under the Company's direct supervision, good workmanship is the result. The catalogue is worth something more than a cursory inspection; for it truly typifies the extent of the art and business of inverted gas lighting.

DAVIS GAS-STOVE COMPANY'S NOVELTIES.

A Barless Gas-Fire.

A visit to the City Show-Rooms, in Queen Victoria Street, of the Davis Gas-Stove Company, for the purpose of inspecting any novelties that the firm may be introducing for the coming heating season, will result in the inquirer coming away fully satisfied that the Luton works are likely, as usual, to play no small part in furthering the advancement of heating-stoves from the scientific and practical side. Various nice patterns are in the show-rooms; but before referring specifically to these, allusion must be made to a new method of construction which has already been applied to quite a large series of fires. Interest is naturally aroused by the statement that a gas-fire can now be procured without any bars whatever in front to keep the fuel in place. The advent of the pillar fuel has already carried us far along this road; but something more was needed before the final step could be taken. This "something more" the Davis Company have provided, and so made the barless gas-fire an accomplished fact.

The barless fire has been rendered possible by the evolution of a suitable fuel; and the production of such a fuel was the task to which the Davis organization set themselves some months ago. Now that success has crowned their efforts, the outcome of the investigation appears simple. But, if they would, the Company might be able to tell of many disappointments before results which they considered consistent with their reputation were at length secured. The fuel, which is to be known as "Reinforced Pyro," consists of pillars of very high radiating efficiency reinforced by means of specially prepared nickel-steel wires. These wires are inserted at the back of the fuel; and their composition enables them to withstand intense heat. The fuel is held in position by means of a flange on the top sliding brick; while at the bottom there is also a sliding brick. This bottom brick is made of comparatively soft and porous material, in order to give the greatest radiating power possible; while the top section is much harder—its duty being, as already mentioned, to hold the "Reinforced Pyros" in place. A special fuel and a special brick are thus the essentials of the barless fire. To place the "Reinforced Pyros" in position, the top section of the sliding brick is lifted by the thumb and fingers of one hand, as shown in fig. 1; and no part of the fire has to be removed. Of course, accidents will happen, and careless people are always to be found. But if the "Reinforced Pyros" are actually fractured in several places, they are still kept intact in the barless fire by means of the nickel-steel wires. An extremely bad case of fracture has been photographed; and the two illustrations (figs. 2 and 3) may be left to speak for themselves. As has already been mentioned, the barless principle finds an embodiment in many different patterns of the firm's stoves which are being introduced for the coming winter season; and some of these are shown in the accompanying photographs. Every one of the barless series of fires is fitted with right and left hand gas connection; and an entirely new duplex burner is an important feature. Another point which may be mentioned is the introduction of a new form of gas and air adjuster. Regulated by the fingers alone, no tools of any sort are necessary; and the operation is easily performed while the fire is burning. It is perhaps superfluous to say that the reputation of the firm in the matter of maintenance has been fully upheld, if not enhanced, by the specialities which figure in the 1910-11 programme—all wearing parts being strictly interchangeable.

Fig. 1.—Placing Fuel in the Barless Fire.

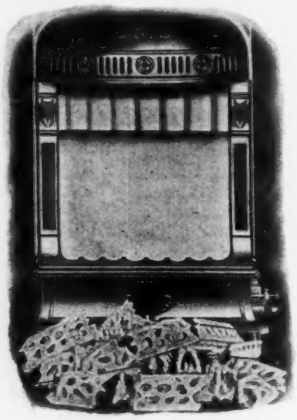


Fig. 2.—A Bad Fracture.

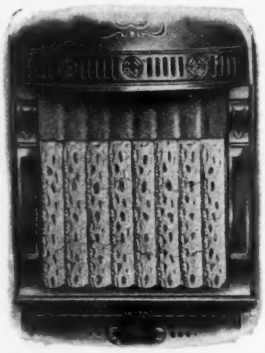


Fig. 3.—The Same Fuel Replaced.

EXPLANATORY OF THE BARLESS GAS-FIRE.

Perhaps here a moment may be spent on the subject of porcelain enamelling—a department of which, the Company express the opinion, only the fringe has so far been touched, and for the development of which they have laid down, in specially constructed buildings at Luton, plant capable of meeting almost any demands which are likely to be made upon it. It is anticipated that, in the hands of the expert chemist in charge, controlling a staff of skilled workmen who have made this particular branch the work of their lives, the results may prove a revelation to any who may have hitherto regarded the porcelain enamelled stove in art colours as being more or less of a luxury.

On the subject of the "Steamless" radiator—with which the name of the Davis Gas-Stove Company has become identified—there is also something to be said. Certain changes have been made with the idea of bringing this apparatus still nearer the perfection aimed at; and among these, is a base entirely independent of the columns. To this base are fitted the burners, the gas-connections, the governor, and the regulating jet. The last two go to form the Davis new patent controller, which combines the functions of governing as well as regulating the gas. It will readily be seen that the base and all pertaining to it may be easily connected to the gas supply, and the columns placed in position afterwards—thus immensely simplifying the handling of the "Steamless" radiator; and, as in the case of the gas-fires, special provision is made for right and left hand gas connections. But these advances have not contented the Company, who have introduced for the present season an entirely new departure in the shape of the "Luminous Steamless" radiator, which is manufactured in two heights and four widths. It is made on the "Steamless"

Fig. 4.—Fire No. 2035.

Fig. 5.—Fire No. 2027.

Fig. 6.—Fire No. 2017.

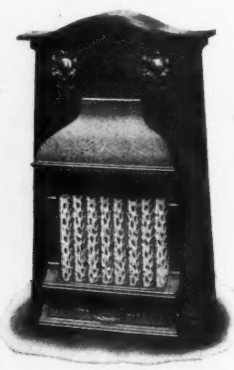


Fig. 7.—Fire No. 2019.

SOME PATTERNS OF THE BARLESS GAS-FIRE.

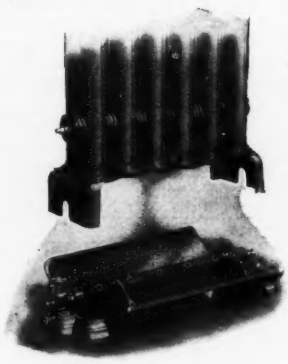


Fig. 8.—"Steamless" Radiator, showing Independent Base.

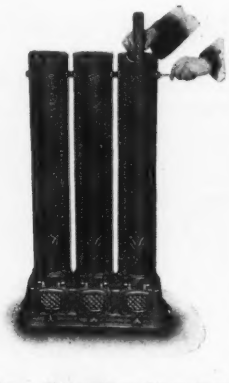


Fig. 9.—"Luminous Steamless" Radiator, showing withdrawing of Inner Tube.

principle, but in addition possesses many unique advantages of its own. A flame of the luminous type is used, and each burner is under separate control; while here, again, provision is made for right and left hand connections. A table top is fitted to the radiator, by removing which the whole of the interior becomes easily accessible. As shown in the photograph, the inner tubes (which are of the same high-class quality steel as those used in the standard "Steamless") may be readily withdrawn without disconnecting or dismantling the radiator in any way.

To return to the subject of fires, mention may be made of two very interesting specialities introduced by the Company. These are self-setting grate-fires, and are known respectively as the "Ritz" and the "Boudoir." Dealing first of all with the "Ritz," it may be remarked that this is provided with a special duplex burner, consisting of front and top section; and this burner is controlled by a single tap. In the front, the fuel is fitted vertically; while on top, it is laid in horizontal rows. In the former case, "Reinforced Pyros" are used; and in the latter, the Davis Company's standard "Pyro" fuel, which achieved considerable popularity last season. If desired, of course, coloured lump fuel may be added, to give the general appearance of an ordinary coal-fire. The "Boudoir" is certainly a most pleasing and very artistic fire; and it may be confidently predicted that this, as well as the "Ritz," will find its way into many drawing-rooms and sitting-rooms. The general principles are the same as those embodied in the "Ritz;" but instead of the horizontal "Pyro" fuel, imitation wood logs are fitted. These logs are excellently dyed; and when in use, the approximation of the effect gained to the old-fashioned wood-log fires cannot fail to be remarked. In addition, the fire is claimed to be a very economical one. We are given to understand that the Davis Gas-Stove Company have bestowed a considerable amount of attention upon the design of their gas-fire canopies; and we are assured that there is no possibility of any of the products being bye-passed into the apartment where the fire might be fixed.

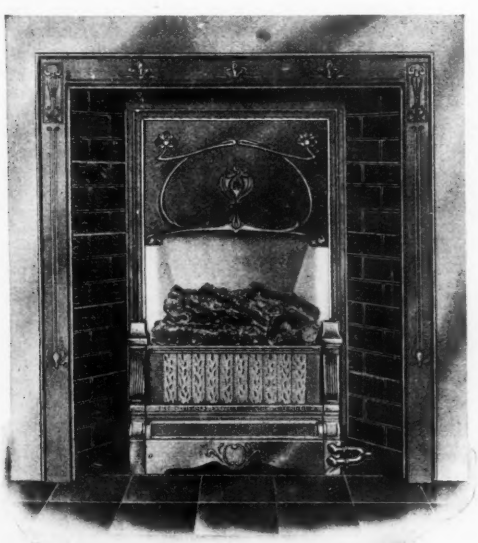


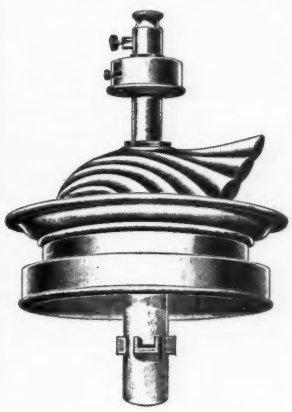
Fig. 10.—The "Boudoir" Log Grate Fire.

In congratulating the firm on the numerous novelties they are bringing out—thus showing their determination to do their full share in keeping the gas-heating business thoroughly up to date—mention may be made of the fact that, in the case of fires fitted with the open front bar, which were a feature of the Davis Company's 1909 programme, the "Reinforced Pyro" fuel is now used, in order that there may be no possible danger of the fuel fracturing and falling out.

NEW BLAND BURNERS.

The Bland Light Syndicate, Limited, are inviting attention to the new forms of their burners. While not departing in any way from the principles that have made their burners gain such a large measure of popular approbation, they have practically reconstructed them, as a result of devoting much time, thought, and experiment to improvements in details and materials, and in obviating that objectionable feature of the discoloration of the metal of inverted burners and the fittings above. The proof of the veracity of claim is found in experience; and a burner that has been in use for some time shows that small defects have been cured by the changes made, and that the metal of the burner is in no sense dirty.

Let us start in the description at the top of the new type of Bland burner. With regard to the regulator-nipples, these are made absolutely gas proof; being tested for this purpose up to a pressure of 12 inches, which is high enough to cover any possible excesses of ordinary pressure conditions. Any burner that will not stand this test without gas escaping at the nipple regulator is rejected until it can pass the severe ordeal. Another test applied is to gas issuing from the nipple. A light is applied. If the flame is of jagged form and not even, the nipple is discarded. In connection with the air admission, a new patent arrangement, called a dust cap, has been introduced this year. It is found that burners, or the nipple-points, after being in use for some time, get choked up with the dust and dirt that enter the mixing chamber. A protector has now been provided (the extended cylindrical portion of the burner seen in the illustration near to the top of the burner) by which the air supply finds admission underneath. Within this, the air-admission chamber has downwardly inclined sides, with slotted holes, and regulation is secured by means of a shutter of the same configuration, which shutter is operated from outside the protector by a lever action, and is then fixed in position by a set-screw. There has been trouble with cheap and flimsy forms of burner through the burner body parting



New Type of Bland Burner, showing New Dust Protector and Bunsen Tube.

New Burner, "A" Type.

company with the gas-nipple, owing to the economy in the provision of threads for attachment. A specially large number of threads are provided in the case of this burner, and, independent of this, there is also a screw-nut for making assurance doubly sure against accident at this point. Before leaving this part of the burner, it may be mentioned that the gas and air adjustments are arranged to be above the closed side of the protecting shell; so that they are not affected by the uprising heat, and efficient regulation can be effected at any time. Coming to the protecting shell, which has always been a feature of Bland burners, this is now treated by a process called sheradizing—well known in America, but with it there is not such acquaintance here. This process makes the metal impervious to the humid conditions of the atmosphere—in other words, metal so treated will not rust or corrode, nor will it be affected by deposit from the products of combustion. Connected with the shell has been another improvement. In the old form of burner, there was an opening between the shell and the gallery, which allowed cool air to rise, and be drawn direct into the lamp. The partial vacuum thus created permitted the products of combustion to escape

quite easily. This was an advantage in the old type of burner; but it is a disadvantage in the new type with the dust-cap protector and under air-inlet, because it is found that a certain small proportion of the waste products climbs up the dome of the shell, and enter the burner with the primary air supply, which in the old burner was taken in downwards into the burner, and not upwards as in the new form. Protection against the disadvantage described has been obtained by inserting between the shell and the gallery, a plate with a curved inner edge, so that the products of combustion strike against this, and find an exit at the one proper opening provided by the shell. Another good point is that it completely ensures the fittings against any discoloration; and no matter how long the burner is in use, the fittings are kept perfectly cool above—the only heat being that conducted by the metal itself.

The next new feature is an important improvement. The old steel bunsen is discarded; one reason for this being that the metal corroded, and often fell in small flakes into the mantle—thus destroying it. Now the bunsen and nozzle are made in one piece, and of a patent electrically hardened steatite. In fact, it is so indurated that one can hardly get a tool to touch it; so that there is no fear of its breaking. A better lighting result is secured through the use of this bunsen tube because of the freedom from obstruction to the flow of gas on the inner surfaces. The diameter of the new bunsen is larger at the top than at the bottom; and, at the point of combustion, the nozzle has a lip. So that everything possible is done to ensure that there shall be nothing but the check of designed regulation to the feeding of the mixture to the flame. Then, in order that the mantle shall hang perfectly straight on the nozzle, the new bunsen is screwed to the burner, and trued-up upon a lathe. These are all contributions to perfection; and the Bland Syndicate claim that, by what they have done, they have secured increased flame temperature, and consequently efficiency. Further, on the point of security. The brass fitting underneath the shell, to which the upper part of the burner is attached, is now made with a reverse screw, so that the action of unscrewing the nozzle shall not result in unscrewing or loosening the upper part of the burner. Then true and close connection between the steatite part and the metal fitment above is assured by having the screw-threads exceptionally coarse. With this burner, one gets a good flame, and an excellent volume of it in the mantle. Every detail seems to have been carefully thought-out; and anything believed to be for the good of the burner and its economical use has been carried into effect.

A few words on special types of the new burner. There is the "A" universal form, with which all standard globes and mantles can be used; or one of the Syndicate's carriers can be applied to take the Bland mantle. A better lighting result, too, is secured by using their inner intensifying pear-shaped globe, which, by the way, is made, as are all the globes supplied by the Syndicate, of the justly-famed "monopel" glass, which it is said does not crack with heat. The globes are also strengthened by having the ends melted. Then there is the "B" type, or intermediate sized, burner. This can be fitted with a nozzle to take an ordinary size mantle, or a medium size one. In this burner, the globes are supported by a carrier, which is attached to the gallery by a bayonet joint. The "Billiard (D11)" burner, the special purpose of which is denoted by its title, is so constructed that it requires no hole for air supply at the bottom of the globe. The mantle and globe are carried by the same fitting; and the air is drawn into the globe at the top, between the gallery and the carrier. A self-intensifying lamp is also seen; and a good looking combination it is. This one takes the Graetzin mantle and inner cylinder. The gallery is specially constructed so that it draws in air through it, which then travels down between the inner glass and outer globe before reaching the mantle. One advantage other than the intensity of the light is that it can be used as an ordinary burner, to take an ordinary mantle and globe, by merely changing the nozzle. The new improvements are found in all the foregoing burners, and for the most part are reproduced in the bijou type, which is a public favourite.

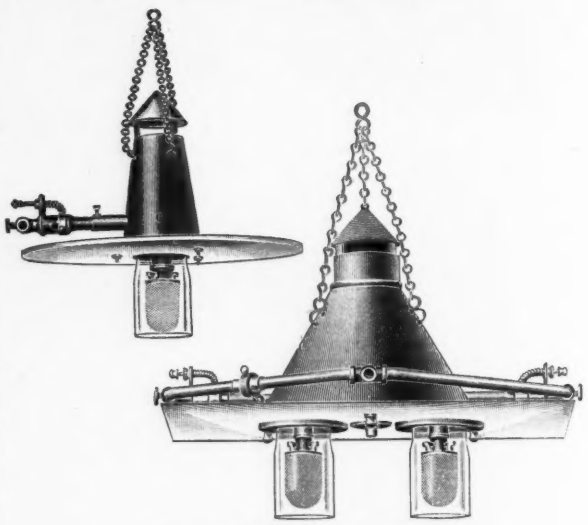
The Factory and Workshop Burner.

[Illustrating the method of attaching the globe and mantle to the burner.]

Then there are the factory burners of which the firm make a speciality. These are particularly suitable for mills and warehouses where there is a lot of dust about. The lamp can also be fitted with the Syndicate's anti-vibrator nipple, with which there is no possibility of leakage.

LAMP CONVERSIONS AND NEW TYPES OF LAMPS.

A STRIKING feature at the business premises of Messrs. A. E. Podmore and Co., of Charles Street, Hatton Garden, at the present time, is the large range of "conversion sets" that the firm have devised for promptly transforming lamps of all shapes and sizes in which the vertical incandescent burner has held sway to the inverted system. Here we have conversion—providing the lantern itself is worth converting—made easy. The firm have been at this work for some years, so that it is not new with them;



Samples of Conversion Fittings.

but all the practical experience that has been gathered in the past has been brought to bear upon the larger extent of work that has come in these days. From north, south, east, and west, lighting authorities are inquiring what can be done, and in the cheapest possible way, in the matter of conversion to the inverted system. But the firm are cautious in advising that the conditions of existing lanterns must be good for the purpose; otherwise it is better to go straight for a complete new lantern, constructed specially for the inverted burner. Of such lanterns they have many types, containing several up-to-date improvements.

But a conspicuous feature for the moment is the conversion of vertical burnered lamps to the inverted form; and for this work the firm have made special provision. Here we have before us conversion sets for square lanterns, cylindrical ones, hexagonal ones, and other shapes; and for one, two, three, four, five, and six burners. Practical requirement and efficiency have had foremost consideration in their design. There is nothing about them that suggests any patchwork conversion. A converted lamp looks the real thing—just as though it had always so existed. We pick up one of the sets for converting an existing lantern to the inverted form. There is a strongly made white-enamelled reflector, above which is a cone-shaped chimney for conveying away the products of combustion, and keeping them quite clear of the incoming fresh air for the supply of the burner. The burner (which is fixed above the reflector, and passes through the cone-shaped chimney) is of the angle type, and is fitted with a screw gas-regulator and a convenient air-regulator operated by a spring and locked in position by a nut, so that vibration cannot disturb

Another Form of Cluster Conversion Fitting.

Lamp for Halls and School Rooms.

the adjustment. This fitting is supported in the lantern by means of a chain carried by a cross bar through the top of the ventilator. Provision is made for the use of inner cylinders or a globe, or otherwise—just as the user's fancy dictates. The gas supply is

conveyed to the burner from the top of the stand-pipe service, by means of either metallic tubing or brass or copper piping. The arrangement is susceptible of several variations—for example, the top of the cone-shaped chimney in one style is furnished with a perforated conical copper piece, in order that any wind getting into the top of the lantern may have a free cross passage, and so prevent down-draughts. This arrangement, however, is not suitable for all lamps. Where a lantern has a dwarfed head, a shorter chimney is necessary, with a cap mounted a little way above the chimney in place of the perforated top. Again the regulators for the air and gas can either be arranged inside or outside the lantern just as desired. But for protection purposes, most people like them conveniently placed inside the lantern. Further, the reflectors are made either to fit the lantern or to leave a space round the sides. They are also manufactured in concave, convex, flat, or any other ordinary styles. Really, the variations are so many, that we cannot note them all; and there are, indeed, no practical conditions that cannot be met by the conversion designs which, by-the-by, the firm make on their own premises. The conversion sets can be easily adapted to any form of existing controller in lamps, and the bye-pass fitted to light either above or below the mantles.

The description will apply to cluster lighting up to six or more lights. Each burner has its own aperture through the reflector; and there is one large diameter cone chimney common to all the burners. These large conversion sets can also be held up by a chain, or supported in the lantern from the reflector.

With regard to the lighting power of the converted lamps, the firm claim that, with their burner, they are able to use a long or a short mantle, in view of the range of gas and air adjustment. Preferably a mantle is used 54 mm. in depth. We have seen the results of some photometrical tests of a converted cluster lamp. The gas consumption, with bye-pass, was 8·4 cubic feet of 14-candle gas per hour, at a pressure of from 2 to 2½ inches. Tested at an angle of 60°, the illuminating power was 270 candles, which is equal to 31·8 candles per cubic foot of gas consumed. A good result!

Turning now to examples of the firm's new designs in lamps. There is one that is very suitable for mission and public halls, school and lecture rooms, and such like places. A large demand for high-power sources of light using inverted burners, but without glass (in view of breakage), has sprung up for buildings of this kind. The lamp is made up of the firm's standard parts; and an excellent looking fitting it makes. The one illustrated is of the three-burner type; and it may be taken as an example of several forms. There is, in this instance, a 20-inch enamelled steel reflector; and above this is an intensive chimney. Three arms support the structure; and these arms provide the gas-ways—being connected by unions to the pipes conveying the gas to the burner. This union connection is merely an instance of how the firm try to put in their work as much practical value as possible. By the aid of the unions the whole structure of the lamp can be readily dismantled. The burners (any number desired can be used) are of cast-brass; and have an imperishable appearance. These are separately provided with gas and air adjustments, and are designed with a view to rough usage, while providing high efficiency. Of course, the limits of use of the lamp are not really defined by the places already mentioned. They can be employed for factories and workshops where a strong light is required on a low-pressure supply. To prevent draughts affecting the mantles, a glass cylinder can be used round them; but it is entirely a matter of choice.

"New Model" Lamp, 1910-11.

(Fitted with parabolic reflector for shop lighting. It can be used without cylinder glasses.)

Coming next to the "New Model" lamp (1910-11), it is externally of the well-known form with an enclosed globe at the bottom, and made for any number of burners within reason. Apart from the efficiency, structurally the new main feature of the lamp is that, *in situ*, just by the removal of three screws, the bottom—including the plate surrounding the mantles, the cone sliding into the chimney, and the globe carrier—can be removed in one piece; thus leaving exposed all the vital working parts of the lamp. The importance of this in maintenance work goes without saying; and, furthermore, in the interests of economy in maintenance, all the parts are interchangeable. The firm do not appear to be particularly enamoured of inner glass cylinders surrounding the mantles inside the globe of such a lamp. They do not disparage their use, but consider that the disadvantages counterbalance the advantages. They furnish an additional seat for breakage; and they become discoloured, if not frequently cleaned—thus serving, in some measure, to obscure the lighting power. Customers can, however, follow their own special views as to whether they adopt the inner cylinder. The lamps are made with or without them; but if without, a simple, inexpensive fitting can at any time be applied for carrying the cylinders. The burners are of the same type and efficiency as those previously described; and standard mantles and glassware can be used with the lamps. The casings are strongly made of copper, and can be had with all metal parts enamelled. They are of a type particularly suitable for hiring-out or hire-purchase, and equally suitable for street lighting as for shops—using a harp or swan-neck at the top of the street-lamp columns. They have a splendid range of light-giving power.

The firm's dust-proof intensive lamp still holds its position in favour; and lately one use to which it has been largely applied is for the lighting of school-rooms, where daily there is a lot of dust brought into the place by children, and constantly being stirred up by their movement. The light-distributing power of the lamp is excellent. Another speciality is the lamp (made in several styles) for hot climates, where the myriads of winged insects have a bad effect on the working of any lamps improperly designed for preventing the entry of the little intruders. We will not describe the lamp in detail. Suffice it to say, it is quite impossible for insects to enter the lamp so as to injure mantles, and choke up the burners. Ingenuity has also produced the design of the structural parts so that the lamps can be readily taken apart.

ENGINE-CYLINDER TEMPERATURE CHANGES.

The following is an abstract of a paper, on the "Cyclical Changes of Temperature in a Gas-Engine Cylinder near the Walls," that was presented to Section G at the Sheffield meeting of the British Association, by Professor E. G. Coker, M.A., D.Sc.

Experiments described in "Engineering" for October, 1908, show that the temperature at the inner surface of a small gas-engine is about 240° C., and the cyclical variation is usually less than 10° C. The steady conditions of low temperature at the wall-surface are maintained by the jacket-water, although the explosion of the gaseous mixture produces very great changes of temperature close to the walls. This variation has not hitherto been measured for a complete cycle, owing to difficulties that occur in effectively measuring the highest temperature of the explosion.

In order to obtain the cyclical variation near the walls, a couple was made of an alloy of 10 per cent. iridium and platinum, with a pure platinum wire; and this was secured in a metal plug so that it projected ¼ inch into the cylinder. On light loads and weak mixtures, the cycle remained unbroken; but near full-load, the platinum wire melted. Couples made from 10 per cent. alloys of iridium and rhodium with platinum were afterwards used, having an electromotive force E above 500° C. given by $E = -174 + 7{\cdot}6075\,T - 0{\cdot}00167\,T^2$, where T is the temperature Centigrade. The junctions were rolled down to five or six ten-thousandths of an inch in thickness, and inserted at a depth of ½ inch from the cylinder-wall. These couples were able to withstand the highest temperatures near the walls; and they were not melted except during abnormal explosions. Measurements of the cyclical variations showed a variation of E.M.F. lying between 1·56 and 7·83 millivolts, with an average cold junction temperature of 30° C. The temperature variation corresponding to these values ranges between 250° and 1700° C.

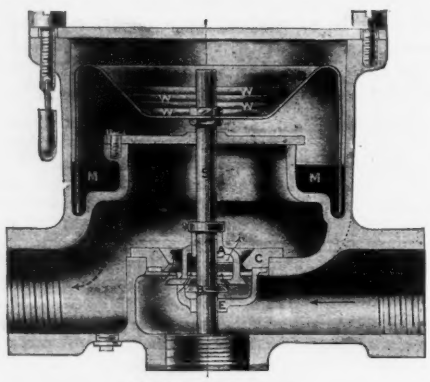
In estimating the highest temperature reached, the upper limit of temperature is indicated by the partial melting of one of the wires when the engine ran above its full normal load; and the lower limit is indicated by the melting of platinum wire. The melting-point of platinum is 1710 ± 5° C.; and, in the absence of definite values of the melting-points of the alloys used, it is assumed that both are below the melting-point of iridium, for which Violle's value is 1950° C. The probable causes of error in measurements are discussed; and the conclusion is reached that the temperature at the place of measurement has a maximum value between 1850° and 1900° C.

The Manchester and District Junior Association have been invited to visit Messrs. J. & J. Braddock's meter-works at Oldham on Saturday next; and one of the staff will contribute a short paper on "Retort-House Governors." A general meeting of the members will be subsequently held, at which the Council will announce the arrangements they have made in the matter of the proposed University Scheme, dealt with by the President (Mr. F. Thorp) at the close of last winter's session.

Coal Storage under Water.—Submerged storage of coal has been adopted by the Twin City Rapid Transit Company, of Minneapolis, as a means of storing for summer use about 12,000 tons of screenings which can be purchased cheaply in the winter season. A concrete tank about 104 ft. by 213 ft. is subdivided into four separate and isolated bins by means of cross walls; the depth being about 14 feet for the side walls and 11 feet for the cross walls. The structure is built entirely of reinforced concrete. At the intersection of the cross walls is a hopper feeding a crushing plant, from which the coal falls through a shaft to a belt conveyor in a tunnel passing under the bins, and running to the boiler-house. Coal is dumped into the bins from railway cars, and is taken for use by a grab bucket worked by a locomotive crane. Each bin has an inlet and drain opening connecting with a pipe system laid in the conveyor tunnel.

THE FOSTER HIGH-PRESSURE GAS-GOVERNOR.

In consequence of the growing practice of supplying gas at higher pressures than heretofore, and the increasing employment of high-pressure gas for all purposes, the Foster Arc Lamp and Engineering Company, Limited, of Morden Road, Wimbledon, have designed what they claim to be a highly efficient and reliable gas-governor, for use on pressures up to, and including, 27 inches. So sensitive is the Foster patent governor to the slightest variation in pressure, that it will operate with the small consumption taken by an ordinary duplex bye-pass. Wherever the main supply at any time is above the normal pressure of 2 inches, the firm strongly advise the use of the Foster governor, as a large percentage of the gas which is unavoidably wasted through incomplete combustion is saved, when this small apparatus is fixed. It is pointed out that in laundries, where large quantities of gas are consumed, a Foster governor is invaluable, not only on account of the reduced gas bill which ensues, but also because a constant temperature is always obtained from gas-heated apparatus—such as irons, &c. This is a point which all laundry managers will appreciate. Another instance in which the governor may be said to fulfil a long-felt want is in printing works using linotype machines, as the type metal is, by its aid, always kept at a pre-determined temperature, which means clean and uniform type.



The Foster Governor.

A.—Main gas-valve, sliding on spindle S, and closing on C. B.—Main valve, forming part of S, and closing on A. C.—Main valve-seating. D.—Inverted cup, floating on M. E.—Three-arm guide for end of S. M.—Mercury. W.—Adjusting weights.

The action of the governor can be readily seen by referring to the sectional illustration. Gas enters in the direction shown by the arrow, and passes between the valves A and B and the seating C into the inner chamber, and so to the house-service. Should the pressure be in excess of that required, the cup D is lifted, which causes A to close on C, and so restricts the flow of gas. Should this be insufficient to reduce the pressure to normal, the cup will still further be lifted until B bears upon A. This cuts off the supply until the pressure is reduced in the gas-chamber, when the cup falls, and so opens the valves in reverse order. This cycle of operations takes place whenever there is a variation of pressure.

THE WHOLESALE FITTINGS COMPANY.

A good example of the growth of a gas-fittings business is furnished by the Wholesale Fittings Company, who, from the very smallest beginnings, have now acquired premises which are conclusive evidence of the large trade carried on in gas-lighting accessories of all kinds, and whose price list has now grown from one page when first issued something like fourteen years ago to more than one hundred and fifty times that size at present. The motto of the firm has always been "Small Profits and Quick Returns;" and its success is seen in the fact that the old premises in Commercial Street, E., have been transformed into a warehouse, and two large buildings have been acquired on the opposite side of the road in order to meet the ever-growing demands for floor-space. These two new buildings, which consist of three floors and a basement, contain excellent offices, show-room, sales department, and packing-rooms; and the remainder of the space is filled with stocks of all descriptions. Not an inch of room appears to be wasted; and business is being carried on at high pressure, even though the season has so far hardly begun. After the bewilderment of hundreds of filled packing-cases and bins, the extensive show-room is quite a haven of rest; and it was here, of course, that we were introduced to the Company's newest goods. Gas-fittings of all sorts and sizes are to be seen there in abundance; while the range of French hard-glass ware is of the widest possible description. There are, too, numbers of beaded shades of different styles and colours, which form an attractive covering for inverted burners.

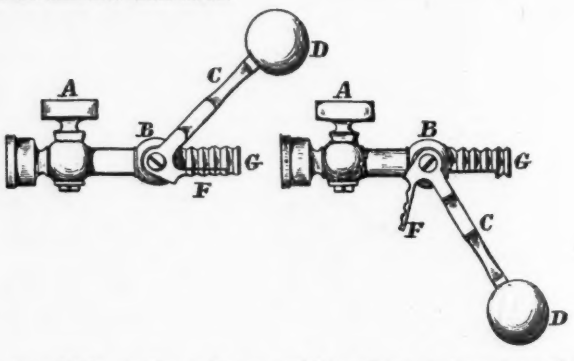
As to lamps, the first type which calls for notice here is the "Ezol-Famos," which is strongly made, for two or three lights, and finished in white enamel. Each burner has its own separate gas-passage outside the body of the lamp; and the gas and air regulators, being similarly situated, are easily get-at-able, without any fear of burning the fingers. Yet another feature is the enamelled reflector plate through which the burners pass, which is removable by simply taking out two or three screws. By this means, it is possible to unscrew the burners and replace them, when necessary, without having to take the lamp down—an advantage which needs no emphasizing. In fact, the whole thing can be taken to pieces while the casing of the lamp remains in the position in which it has been fixed. The "Ezol" lamp, noticed on a previous occasion, which is made for one, two, or three lights, is also now fitted with this removable reflector plate. A handsome indoor gas-lamp, which can be had finished in copper-bronze and white enamel, is the three-light "Yotto" (illustrated). This is intended for use without chimneys, and with either clear or frosted globe; the globe-carrier being provided with a number of holes, by means of which the necessary draught of air is secured. One of the advantages urged for the "Yotto" is its cheapness—indeed, moderate prices are one of the principal features claimed for the firm's goods, though at the same time quality is not allowed to be sacrificed to this end. The "Ezol" adapter for converting street-lamps to the inverted system, which was referred to twelve months ago, is, we learn, being largely adopted. One form has been arranged for three burners; and by a simple movement of a revolving bar on its axis, one, two, or all of the burners (according to the extent of the turn given) can be lighted up or extinguished. This arrangement is very useful in places where, though some light is required to be kept on, the maximum power of the lamp is only needed during certain hours. A single-light adapter of simple form also meets with a ready demand.

The "Yotto" Light.

A SAFETY TAP FOR FLEXIBLE CONNECTIONS.

A paper was read at the last meeting of the Association of Gas and Water Engineers of Austria-Hungary, at Innsbruck, by Herr V. O. Keller, the General Manager of the Central Gas and Electricity Company of Budapest, describing "A Safety Tap for Flexible Connections," of which the chief points are as follows.

There have been many cases of accidents (frequently involving loss of life) due to flexible tubing sliding off the tubulure of a wall tap which has been left open, and so allowing the gas to escape freely into the room. Suggestions for avoiding such accidents have been made from time to time—among others by Herr Peischer, of Innsbruck. Directions have also been issued to consumers, requesting them always to turn off the wall tap as well as the tap at the burner, when the latter is put out of use. But if, through forgetfulness or laziness on the part of them or their servants, this request is not obeyed, the danger of an escape of gas, through the flexible tube slipping off the nozzle of the wall bracket, remains. Herr Peischer has pointed out that at least half the cases of gas poisoning which occur in private houses are due to flexible connections slipping off the tubulure of the wall tap through their own weight, and so allowing gas to escape. Recently two servants in Vienna lost their lives from this cause; and there was a similar fatal case at Innsbruck in 1906. In order to prevent the possibility of the occurrence of such accidents, Herr Keller has designed and patented the safety device shown in the annexed illustration.



In addition to the ordinary upright wall tap A, there is on the tubulure a horizontally-set tap B, to the plug of which is attached the forked-arm C, which terminates in a ball-weight D. The lower prong of the fork forms an extension F, which constitutes a

segment of the tubulure G. When the rubber tube is to be put on the tubulure, the fork is lifted until the segment fits in place on the tubulure; and the tube is then pushed over the two. The fork is held in the raised position by the tubing; and the cock B then remains open, so that when the tap A is turned on gas passes freely to the burner. If, however, the flexible tube slides off the tubulure, the fork C at once descends through the weight D, and, turning the cock B through 90°, completely closes it. Thus the flow of gas through the open tap A is cut off by the closed cock B. The apparatus behaves perfectly, as it depends for its action only on the weight of the ball D, and obviously under normal conditions it cannot get out of order.

Its use should entirely preclude the occurrence of accidents due to flexible connections sliding off the tubulures of wall taps which have been left open. The first illustration shows the device with the arm raised ready for putting the flexible tube on to the tubulure; while the second one shows it after the arm has fallen and closed the cock B.

MEASURING AIR OR GAS SUPPLY TO ENGINES.

One of the papers submitted to Section G at the meeting of the British Association was by Professor W. E. Dalby, M.A., M.Inst.C.E., on the "Direct Measurement of the Rate of Air or Gas Supply to a Gas-Engine, by Means of an Orifice and U-Tube." The official abstract is as follows.

An orifice in conjunction with an anemometer was used to measure the air supply at the Ashton trials of the Committee of the Institution of Civil Engineers; and more recently Professor Ashcroft contributed a paper to the Institution of Civil Engineers describing a method of using an orifice in conjunction with a specially designed indicator, to measure the difference of pressure on the two sides of the orifice. In the Ashton trials, the air supply is inferred from the anemometer readings; and in Professor Ashcroft's method, the air supply is inferred from the difference of pressure in conjunction with the orifice, which was made about the same size as the suction-pipe of the engine, in consequence of which the difference of pressure was very small. In each case, calibration was effected by driving the engine from the crank-shaft end, and then from indicator diagrams deducing the weight of air passing through the orifice. This deduction cannot be made accurately unless the temperature can be accurately measured at one point on the indicator diagram. In neither case could this temperature be measured.

The gas-engine used by the author is fitted with apparatus by means of which the temperature corresponding to the pressure and volume at an assigned crank-angle can be accurately measured with a platinum thermometer. Thus, all the data are observed from which the weight of air drawn through the orifice per cycle can be computed. Indicator diagrams were taken with an optical indicator giving accurate results. Every indicator-card was calibrated for pressure *in situ*. The peculiarity of the method is that a relatively small orifice is used—so small, in fact, that the difference of pressure on the two sides of it is equivalent to about 1 foot of water under normal conditions of running. This difference of pressure can then be measured by a U-tube; and small variations of head are easily observed. Numerous experiments established the fact that the coefficients of the orifices tried were practically constant, and equal to 0·6.

The gas supply can be measured through an orifice in the same way. Hence, the mixture of air and gas passing into the cylinder can be obtained from two readings, with suitable corrections for density, at any time during the run. The orifices, in combination with their U-tubes, become rate-measurers; the one giving the rate at which air is supplied to the engine, and the other the rate at which gas is supplied.

Mid-Rhenish Association of Gas and Water Engineers.

The programme of the 47th annual meeting of this District Association, fixed for the 3rd to the 5th inst., at Gmünd, in Swabia, included the following items: On Saturday, the 3rd inst., an inspection of the town water-works in the afternoon and the inaugural reception of members and guests in the evening. On the 4th inst., in the morning, the reading of papers on "Experiences in the Regulating of Inclined Retort-Settings," by Herr Heinrich, of Pforzheim; "Dry-Sealed Purifiers," by Herr Fischer, of Esslingen; "The Gmünd Corporation Gas and Water-Works," by the Manager, Herr Geyer; "The Control of the Working of Gas-Works through the Instructional and Experimental Works of the German Association," by Dr. Karl Bunte, of Carlsruhe; "The New Stuttgart Gas-Works," by the Manager, Herr Göhrum; "Coal and its Valuation for Gas Making," by Dr. F. Mayer, of Mannheim; "Bauduin's Distance Indicator of Gas-Pressure and Water Level," by Herr F. Lux, of Ludwigshafen-on-the-Rhine; "Results of the Gasification of Saar Coals which have been long in Store," by Herr Heinrich, of Pforzheim; and "Simplification of the Clerical Work on Gas and Water-Works by the use of the Addressograph," by Herr H. Welty, of Bâle. Various technical questions were also set down for general discussion. The banquet was fixed for the evening of this day. For Monday, the 5th inst., there was an inspection of the local gas-works, and an excursion. Those attending the meeting were invited by Herr Göhrum, the Manager of the Stuttgart Gas-Works, to visit the works.

THE PROVIDENT USE OF COAL.

By Professor H. E. Armstrong, F.R.S.

[A Paper Read before Section B. of the British Association, Sept. 6, 1910.]

During my four months' stay on the American Continent last year, the topic which came most prominently under my notice as of consequence was that of the conservation of natural resources. Mr. Roosevelt's most abiding claim to the gratitude of the world will, I think, some day be admitted to be that he has made this the subject of burning controversy in his country. To what extent are we alive to the fact that we have natural resources to conserve? is the question ever asked here in Sheffield in connection with coal, for example.

I assume that it will be admitted, by all who are capable of judging, that we are improvident in our use of coal. It is only here and there that engineers and manufacturers are being forced to economize on account of the constant advance in the cost of fuel. In far too many cases it is being consumed most wastefully, without any attention being paid to economy. I do not propose to deal with the use of coal for industrial purposes generally. I shall confine my remarks to its consumption for domestic purposes and in the gas industry; and I shall be very brief, as my one object is to call public attention to a very simple issue.

In burning coal as we do in open grates, we not only burn it in the most wasteful manner possible, but in such a way that we are a nuisance to ourselves and to our neighbours. The evil consequences are too apparent to need description. How are we to avoid these? Probably they are unavoidable so long as we burn bituminous coal. In burning bituminous coal, however, we not only create a nuisance, but we also waste much that is valuable. Can we save this, and avoid creating a nuisance? The answer is, I believe, that we can, and that in effecting the saving we shall also be taking the steps that will enable us to avoid creating the nuisance that now attends the use of bituminous coal as a domestic fuel.

During the early stages of combustion, a variety of volatile inflammable substances are given off, which burn with a smoky flame. By first coking the coal at a low temperature, we may remove and recover these, and obtain a fuel which both takes fire and burns as readily as coal, and on the average gives a better and a hotter fire. By burning such soft coke in our towns, we might get rid of the smoke nuisance—if not entirely, to a very large extent. In making such soft coke, we should separate from the coal substances of considerable value for a variety of purposes that are now entirely wasted. I am even prepared to go so far as to urge that such a policy be made compulsory at no distant date in our towns. The subject has been in my thoughts during the past thirty years. In the early eighties, I was led to pay much attention to the bye-products in the manufacture of gas from oil, as practised by the various railway companies in making gas for compression, to be used as an illuminant in railway carriages—an industry that is now somewhat in abeyance. I also studied the tars from Jameson coke-ovens, where coal was coked so that the volatile products were given off at a very low temperature compared with that prevailing in a gas-retort.

In a note communicated to the Iron and Steel Institute in 1885,* I ventured to insist that we knew practically nothing of what happens when coal is distilled, or of the conditions most favourable to the production of the most valuable constituents of coal-tar, and that until we possessed accurate knowledge on such points, the coking of coal and the manufacture of gas from coal could not be conducted scientifically. I urged that experiments should be made. Nothing was done until the Coalite Company took the matter in hand quite recently. Coalite is nothing but soft coke formed by heating the coal until all the volatile products which burn with a smoky flame are given off. I have availed myself of the opportunity which its manufacture affords to examine the products of the distillation of coal at temperatures perhaps not exceeding 800°C. The investigation is only in the early stage; but I have already learned quite enough to convince me that the tar obtained is—as, indeed, was to be expected—very different from ordinary gas-works tar, which is clearly a mixture of the end products of numerous and complex changes undergone by the primary products of decomposition of the coal substance at high temperatures in contact with intensely heated carbon.

Coalite tar consists of the primary products of decomposition and of products of their interaction at relatively low temperatures. It contains a not inconsiderable proportion of saturated hydrocarbons—in fact, of petroleum—together with unsaturated hydrocarbons of the olegine and acetylene series, and a relatively small proportion of benzine and its homologues, but no benzonoid hydrocarbons of higher series. All these hydrocarbons are most valuable solvent materials, and might be used in the internal combustion engine. Phenols are present in far larger proportion than in ordinary coal-tar—particularly the higher homologues of phenol. But little ammonia is produced during distillation; and basic substances appear to be less abundant than in gas-tar.

To account for the presence of paraffin and unsaturated non-benzonoid hydrocarbons, it must be supposed that coal contains

* See "Journal," Vol. XLV., p. 960.

a very considerable quantity of "fatty matter" of some kind, as such matters are known to yield petroleum hydrocarbons on distillation. I am inclined to think that the benzines are in the main synthetic products formed by processes akin to those by which such hydrocarbons are produced in the manufacture of oil gas. The proportions in which the various homologues of benzine are present appear to be somewhat different from those in which they occur in ordinary coal-tar. The phenols are presumably directly derived from hydroxy-benzonoid compounds in the coal; and it will be a matter of considerable interest to establish their nature. The greater proportion of benzines in ordinary coal-tar is probably due to the conversion of the phenols in large part into benzines by the action of heated carbon. The gas given off during the coking process is very rich.

In the first place, I would advocate that this gas be substituted for the rubbish now produced by carbonizing coal at very high temperatures, so as to obtain the maximum possible yield of gas. It is absurd—no other expression is suitable—that the production of gas from coal in this manner should constitute a primary industry, especially as the coke which is produced is not suitable for ordinary domestic use. It is time the public realized that the article now supplied is beneath contempt, and that a better article is at hand, and can easily be supplied.

Great improvements are in sight in the application of gas to heating purposes; and it is to be expected that the use of gas will be largely extended in the near future. But if this is to come about, it is essential that the quality be improved. Since the sulphur clauses in the Gas Acts were repealed, there has been a steady deterioration in the quality of gas; and the damage done to furniture in consequence is now most serious. If the gas industry desires to retain its position within doors in competition with electricity, some action must be taken to supply a product free from the objections to which our present supply is subject. While low temperature coal-tar will yield a far larger supply of phenol compounds suitable for use as disinfectants, it cannot well serve as a source of benzine and toluene, as these latter are mixed with so large a proportion of petroleum hydrocarbons that it will not be possible to separate them economically.

Distinct uses must be found for the hydrocarbons in the higher distillates. It will be possible, I believe, to make any class of solvent hydrocarbons that is desired from them without difficulty. They should be valuable for cleaning purposes—far more so than ordinary petroleum spirit or petrol—as rubber solvent, and a substitute for turpentine, the demand for which is now in excess of the supply. Much of the oil is also suitable for use in the internal combustion engine. It has been shown recently that the sterilization of soil by means of toluene and similar substances has a most remarkable effect in increasing its fertility. Should it prove practicable to sterilize the soil as a part of the ordinary farm practice, it is more than probable that a suitable agent will be found in the lower distillates from coalite tar.

My object in this brief communication is to direct attention to a provident use of coal, which I believe deserves most serious consideration by the public at large. I see no reason why the coal now used in the raw state by a community should not be first coked at a low temperature. The gas given off would be available as an illuminant, and for heating purposes. The residual coke would be burned with far greater efficiency than the original coal, and without producing smoke. If washed coal were used, the sulphur would be largely eliminated, and a still further improvement effected. A variety of bye-products would also be obtained, the sale of which should afford some (if not considerable) profit.

Science is of little public value if it cannot be brought to bear on such a problem; but it rests with the public to take action. Some interest must be shown in the matter, if the lethargy which now prevails and the vested interests which bar progress are to be overcome.

Discussion.

The PRESIDENT (Mr. J. E. Stead, F.R.S.) quite agreed with the author that it was barbarous to use coal in an ordinary fire; and this was one direction in which science could be applied with great advantage in a practical way. With regard to the production of gas, Professor Armstrong had made some remarks at Middlesbrough on one occasion, with the result that a gentleman present had gone back to his steel works and made great improvements in his producer plant; and the economy in coal consumption at this works ever since had been very considerable.

Professor ARTHUR SMITHELLS (Leeds University) said this was a subject upon which it was exceedingly easy to be indiscreet. Professor Armstrong would probably find, as he had found before, that he would come into conflict with a good deal of opposite opinion. They would all sympathize with the desire which animated the paper; for the economical consumption of coal was of national importance. But whether the question was to be solved on the lines indicated, was quite another matter. He felt confident that many people would not agree with the author. The idea of using fuel carbonized at a low temperature was by no means a new one; and he believed it had been recognized for some time that the bye-products obtainable by carbonizing coal at a low temperature had certain constituents in greater proportion than in tars accumulated by the ordinary process of coal carbonization, which added to the value of the bye-products. The whole question, however, was an economic one. The point that remained to be proved was whether or not coalite, and fuels of the same character, could be produced under conditions which would enable them to compete economically with coal and its products, as put upon the market under existing conditions. If so, he believed the public would use them. Among consumers of domestic fuel, there was no doubt a very widespread desire to contribute towards the abatement of the smoke nuisance. But, even so, the public would have to be shown that these new fuels had the same advantages in giving the cheerful fire—to which they had been so long accustomed—and at the same time were not more expensive than coal. This had not been proved; and until it was proved, it would be hopeless to commend it to the public, or to expect the public to take the lead in the reform which Professor Armstrong and so many other people had at heart. Personally, he was very much interested in the question, inasmuch as the Leeds University were closely associated with the coal industry, and also with the coal-gas industry; and they were endeavouring to contribute, in their way, to the solution of the problem, by seeing what was possible to be done by the use of coal gas as a heating agent. This was another direction in which something might undoubtedly be accomplished, to mitigate the smoke nuisance and conserve the supplies of fuel in this country. They were only at the outset of their work; and it was not necessary for him at present to say more than that they hoped to assist in the solution of what was undoubtedly a most important national problem. They must, however, all realize that it was useless to rely upon the theoretical efficiency, or upon the intrinsic merits, of the particular fuel which was being commended to the public. Regard must also be had to the pecuniary advantages.

Mr. A. W. OKE remarked that, as a director of several gas companies, he had naturally watched with great care for any complaints as to the quality of gas. The author had referred to the deterioration of gas, and also to the effect of the sulphur compounds since the repeal of the sulphur clauses. His experience had been that there was no increase in the number of complaints; and he was surprised to hear Professor Armstrong take such a gloomy view of the question. While indebted to the author for his paper, he (Mr. Oke) contended that gas managers were doing very much now to preserve the use of coal, by getting a great deal more gas out of it, and by producing it at a price which enabled its use to be greatly extended for cooking and heating, and thereby lessening the evil that Professor Armstrong was so anxious to see remedied.

Professor G. T. BEILBY said he was very grateful to the author for having brought forward the question of low temperature distillation of coal, because he believed that in this direction considerable help would be obtained towards the end they had in view. The whole question at the present time, however, was in an experimental stage; and he, for one, had been waiting with great patience, and with very vivid interest, on the results which would attend the labours of the British Coalite Company in their efforts to supply the public with a cheap and smokeless fuel. The progress of this concern seemed to be rather slow. The undertaking was heralded, perhaps, by too much advertising and sound of trumpets; and some of them had almost come to the conclusion that there had been an anti-climax in the matter. However, he was given to understand recently that installations for the production of coalite, so-called, were gradually extending throughout the country, and that there would soon be many object-lessons in the production of this fuel. Economically, he would draw attention to the large figures in which they had to think if they wished to deal with this question in a masterly way. The present consumption of coal in the country for purely domestic purposes was of the order of 40 million tons, while the gas companies distilled about 14 million tons for the production of gas. In order to supply the public with this 40 million tons of solid fuel, it was evident that not only must the gas industry be completely revolutionized—if not wiped out—in its present form, but some other very large uses would have to be found for the gas and other liquid products to which Professor Armstrong had referred, the value of which might be anything from 50 to 100 per cent. more than the original value of the coal.

Professor C. H. OLDHAM, as an economist, asked Professor Armstrong how he hoped this reform would be carried out commercially. He had been told that some German firm of chemists had asked permission to erect coke-ovens in South Wales in order to turn any amount of coal into coke, which they would supply for nothing, provided they were allowed the bye-products. This offer was not accepted; but the local colliery owners were now putting up their own coke-ovens, and were beginning to employ chemists as an auxiliary branch to the coal business. He did not know the details sufficiently; but it seemed to him that, if the ideal which Professor Armstrong saw in the future was to be realized practically in commerce (and they all hoped it would), it was only to be done by a development of the colliery business in this direction—viz., by the addition of the chemical side. If this came about, there was a prospect of the coalowners giving away the coke and living on the bye-products.

Mr. ARCHBUTT (Derby) said that people were being continually urged to burn gas instead of coal, on the ground that, by so doing, fogs would disappear. Personally, however, he thought the use of more gas would add to fogs, owing to the large quantity of sulphur in the gas, which tended to form fog. One speaker mentioned the fact that he did not get complaints from consumers.

Mr. OKE: Not more than before the repeal of the sulphur clauses. Of course, we get complaints.

Mr. ARCHBUTT said that he did not think people knew what an

evil this sulphur was. It was responsible for all the brasswork and silverware in a house becoming tarnished. He could not help thinking it was a very great mistake to allow the sulphur clauses to be repealed.

Mr. BOOTH, speaking with regard to the low-temperature distillation of coal, said he was acquainted with a venture in which this was being undertaken in an almost complete vacuum. An air-pump was used in connection with the retorts, which kept a vacuum of about 25 to 27 inches. The product was a household fuel something in the nature of coalite; and the bye-products were of a similar character.

Professor ARMSTRONG, in reply, referred first to the effect of sulphur in the gas. He said he was on the South Metropolitan supply; and all the brasswork in his rooms was quickly covered with verdigris, when the slightest moisture was about. It was not safe to allow a picture to hang by the same wire for more than a year. He did not want electricity in his house; but he had been simply driven to it since the late Sir George Livesey got the sulphur clauses repealed. People were not aware of what was going on; and the makers of the gas themselves did not know what they were perpetrating. He was very glad this point had been raised, because no protest could be too emphatic against the present gas supply *quâ* sulphur. Further, the illuminating quality was being run down, and an attempt was being made to put a calorific value on gas, and to reduce the cost still more. He ventured to contend that this was in the wrong direction altogether. It meant the use of a very large radiant, whereas they really wanted to copy electric light and go back to the small radiant. The question raised many important issues; and this was the reason why he brought it forward. The bye-products which could be recovered by low-temperature distillation were far more valuable than present coal-tar products for all purposes other than those of colour making. For these, they needed the present coal. But coke-ovens would supply sufficient of that; for coke was going to be made at no distant time in such a way that the volatile products would be recovered. Then there would be more than enough coal-tar from this source.

A vote of thanks was accorded the author.

HIGH v. LOW PRESSURE GAS DISTRIBUTION.

By H. W. FRUND.

[A Paper Prepared for the Southern Gas Association, U.S.A.]

Not so many years ago, in the electric fraternity, there were two factions—the low pressure dogmatic advocates and the high-pressure boosters. Able minds were on both sides of the question; and invested interests in low-pressure work (including the Edison system of distribution) for a considerable time were in the lead. Not until about 1895 was it conclusively shown that high-pressure electric transmission had come to stay; and the advocates of the Edison system then began to change tact. Space is too brief to go into the revolutionary advancements made in the electric field to high pressure, and which are not to be wondered at considering the infancy of the electric industry. Not so with the technical and mechanical progress in the gas industry. In an old established industry like ours, it could hardly be expected that advancements would be made on giant strides as in the electrical field. However, high-pressure gas lighting under recent developments constitutes probably one of the most interesting and important steps in the progress of our industry, and has come to stay. As in former years in the electrical field, the low-pressure advocates fought strenuously against any change, so to-day with the low-pressure gas adherents, some of whom think the time has not so far come when high-pressure supply to low-pressure distribution should be seriously discussed.

High-pressure gas distribution is pointing the way in which gas is destined to cope with electricity for its share of the illuminating business. Detroit, Boston, Chicago, St. Louis, Milwaukee, Trenton, and other large cities are experimenting with high-pressure lighting with encouraging results. In Europe greater progress is being made than in the States; and, therefore, it is well that this question be brought before the Association—the end in view being a discussion of experiences had among the few operating high-pressure gas distribution, and also to and for the benefit of those either wavering on the question or contemplating putting in high-pressure plants. It is not intended in this paper to set forth at all minutely the experience had with high pressure, as it would be too long. The object is rather to base a line for discussion of experiences had among the members of the Association.

The proposition in question is made up of a coal and water gas plant with low-pressure distribution through large atmospheric pressure mains, and high pressure through small steel mains. The low-pressure system was first installed to serve customers residing in the city wherein the gas plant was located. The high-pressure system was afterwards installed to supply gas to an adjoining town of 3500 population, three miles distant from the gas-works. Such good results were obtained with the high-pressure distribution that a portion of the city having the large low-pressure mains is now being supplied by high-pressure gas—independent however, and not tapped into the low-pressure mains, as no boosting of pressure or supply in low-pressure mains is necessary or required.

The plant consists of two compressing engines (one held in reserve), one compression tank with the necessary governors, regulators, &c.; the compressors taking gas from a large holder through a gas-main line 400 feet distant. At the gasholder, the initial pressure is 35-10ths. The gas is first compressed into a small tank at 45 lbs. pressure; then released and discharged into 2-inch mains, where the pressure is automatically maintained, day and night, without a storage tank, at 5·5 lbs. pressure. Individual regulators are installed on each service, where the pressure is again reduced to 35-10ths.

From the point where the gas-main leaves the works to the first right-angle turn in a public highway, distant 350 feet, the high-pressure gas-main is 7 feet lower than the compressor, and is the only point on the entire line of all the mains where there is a drip, from which we occasionally (more particularly during the four winter months) drain a discoloured water deposit. From this drip, the main inclines till, at a point 800 feet distant, the mains are 20 feet higher than the main at the drip.

The pressure upon the gas, no doubt not being sufficient to carry the water over the hill, undoubtedly is one of the reasons no trouble is experienced with complaints in the districts supplied by high pressure. Since the installation of the plant, no liquid or naphthalene troubles or other complaints have been experienced; while more or less naphthalene complaints come in from the low-pressure mains distributing gas from the same holder providing for the high-pressure mains. On every occasion that presents itself, high-pressure mains and services are examined; and all are without exception found perfectly dry. The only trouble thus far experienced is in some of the services choking-up at the corporation cock with a rust formation caused by a too small ($\frac{1}{8}$-inch) opening. Since cocks with $\frac{1}{4}$-inch openings have been adopted, this trouble has entirely disappeared. Occasionally, we get a little distillate in the compression tank, which is then drawn off. Drips along the entire high-pressure line have been opened many times, and never has there been found anything in a drip on the main, in or between either of the two towns, except one near the works at the foot of a hill.

The temperature at the compressors when working at full capacity during the summer months is 115°; and during the four winter months, it is an average of 65°. Thus far the investigation of the effects of compression and transmission on the candle power and heat units of the manufactured coal gas has not been fully ascertained. Suffice to say, with the plant in question, the quality of gas does not appear to suffer in candle power by comparison with the same gas distributed in the large low-pressure mains. This may be possibly accounted for—as there is no rapid condensation to reduce the initial power of the gas, even in the colder months—through plant being located in the South where the frost seldom more than enters the crust of the earth; and, therefore, the mains, though laid shallow, are not affected.

It is now being generally admitted, from investigation of the effects of coal gas compression, that it does not affect the fixed gases to any great extent where the work is carried on above the critical pressure; but where vapours are dealt with which can be condensed, attention must be paid to this point. However, whatever are the barriers in the way of high pressure, the benefits derived overbalance them many fold. Where proper distribution of gas in low-pressure mains is bad, and conditions become acute, high-pressure work comes to the relief. Large deliveries can be obtained through quite small pipes by this system. Naphthalene, water, and other stoppages are practically unknown; and the service to consumers is always satisfactory, as there is excess of pressure on the inlet side of the governor, which insures an unvarying pressure on the house pipe, so that if more volume of gas is needed it is obtained without reducing the pressure.

Again, high-pressure transmission can be used to supply several small towns which are already piped with mains for low pressure. And particularly, if the town is improperly piped and the service is unsatisfactory, a small high-pressure loop may be employed to surround the town and feed through small district governors into the dead-ends of the low-pressure system. Or in some cases, a high-pressure spine may be run through the middle of the town, feeding into the low-pressure system on each side through small district governors.

There is also a possibility of high-pressure gas playing a part in this country in public street lighting. The Committee on Street Lighting for the City of London, which visited the Continent to investigate the public lighting conditions, visited eight cities, and have recommended high-pressure incandescent gas lamps with inverted burners. In the future, incandescent gas lighting only will be used in Berlin. Some of the plants on some streets will have inverted high-pressure gas-lamps of 4000-candle power; other streets 2000-candle power; and, again, other streets of less importance 1000-candle power.

There should be no hesitancy at this time, and with experience had, to break-away from the old and established practices and instal a high-pressure system—particularly for new gas-works in a city ever so large, or town ever so small, in population.

The Sir John Cass Technical Institute.—The new session of this Institute, which is especially devoted to technical training in experimental science and in the artistic crafts, will commence on Monday, the 26th inst. The syllabus includes a series of courses on "Liquid, Gaseous, and Solid Fuel," which comprise lectures and laboratory work on "Fuel Analysis" and on "Technical Gas Analysis."

ELECTROLYSIS OF PIPES.

[From "Engineering Record," New York.]

The extreme probability of electrolytic injury to buried gas and water pipes is familiar to all engineers; and the actual results of such electrolytic corrosion have become unpleasantly familiar. Yet, in spite of the importance of the subject, and the serious nature of the damage which has been done in some cases, there has been as yet no definite agreement as to the proper remedial measures to be undertaken. The source of the injury is, in almost every instance, the currents which come from the use of the ground as the return by electric traction systems. Very few cases of injury have ever been definitely ascribed to accidental leaks upon lighting systems, even where a grounded neutral wire might give opportunity for such leaks. Obviously, casual leaks due to faulty construction are much less likely to turn a material amount of stray current into the ground than is the deliberate use of ground return on a large scale.

Theoretically, the return current of a railway system is through the bonded rails; but where these run parallel to pipe-lines, more particularly in moist earth, the actual amount of current passing from the rail through the pipes often rises to a very considerable amount. And here is just where the trouble begins. The widely varying underground conditions are sufficient reason for the extraordinary variations in results in different localities. In some cities electrolytic troubles are almost unknown; in others they are very severe. And just so in some lines of pipe, apparently exposed, no serious corrosion has occurred during years of service; while in others, in appearance no worse situated, perforation has taken place in a few weeks.

A recent report on electrolysis of the American Gas Institute deals at length with the subject; and the conclusions reached are highly important. Of remedial measures for both gas and water pipes, several have proved to be measurably successful. Thorough bonding (which is important to the traction systems themselves) helps very materially; and the addition of liberal return feeders, carried overhead to a properly bonded system, will generally reduce stray currents to comparative insignificant amounts. Of course, a complete overhead return eliminates all electrolytic difficulties. But this involves such considerable difficulty in construction and maintenance that it has generally been abandoned as impracticable; and the loss of the very large conductivity of the rails would be a serious one. Thorough bonding and return feeders arranged to relieve sections of track from which stray currents would be especially feared, seem in many cities to give excellent results. In some cases, the addition of negative boosters, to help along as it were the return current, has removed most of the stray currents.

The main trouble in applying this remedy is that only a very thorough investigation of the underground conditions enables one to tell definitely where to apply the return. And even so, there is considerable chance that some danger spots will escape protection; for the course of ground currents is somewhat erratic. Danger to pipes consists mainly in intense local action, rather than in a mild general corrosion. The typical pitted character of electrolytic injuries is sufficient evidence of the remarkable localization of the damage, which is unquestionably helped along at times by local differences in the conductivity of the ground. Aside from the complete overhead return and the partial overhead return, to which reference has been made, the chief remedies are protection of the pipe by insulating coating, so that the current cannot get in and consequently cannot do damage by its exit, and insulation of the pipe joints, so that the current does not find the pipe a continuous conductor for any considerable distance.

As far as complete coating of gas or water pipes by surface insulation goes, there seems to be very general agreement, strongly backed up by the Committee report in question, that the procedure is ineffective. Paints or other supposedly insulated coverings are not, in other words, very reliable as regards electrolysis, although they may to a certain extent protect the pipes from any chemical action. If the current once gets into the pipe through a flaw in the covering, and finds an exit through another flaw, at this latter point there is apt to be strongly localized damage, so that perforation might be actually more rapid than if the pipe were not protected at all. The other recourse is to lay the pipe with insulating joints, so that the flow of current is practically checked. The Committee report shows that this remedy is upon the whole successful, particularly if a considerable proportion of the joints are insulating joints—such as are obtained by laying gas-mains with cement. If joints were thoroughly insulated, the danger from electrolysis would be for the most part removed.

Sometimes a drastic remedy has been applied to the pipe-systems, consisting in laying them with conducting joints, and then tying-in the piping system to the ground-return so that the current would leave the pipes *viâ* a copper conductor instead of the earth. The Committee report strongly condemns this method, because while if the pipe were actually a continuous conductor it would be thus freed from danger, any imperfectly conducting joints might become the seat of serious trouble, and adjacent and less perfectly conducting pipe systems would tend to give up their current to the better conductor, and hence would be exposed to electrolytic injuries. In other words, it looks very much as if the alternatives were either to insulate the piping systems thoroughly at the joints, or make them so completely conducting that they could safely become part of the grounding return. The former procedure is in most cases very much the safer and easier to carry out; it being much easier to check the current flow along the pipes than to make it complete enough to avoid risks. In the former case, too, there is less danger of localized action; and it is this which produces practically the most serious damage.

To sum up the general conclusions of the report in their relation to the existing situation, it is apparent that the first requirement in getting rid of electrical trouble is to make the tracks which are the legitimate return as good conductors as possible, and to help them out at all danger points by overhead returns; and then to make the pipe-lines as bad conductors as possible. In some few cases local protection of the pipes by an insulating covering may help; but anything more than what would be indicated as a palliative, for general corrosion would seem to be unnecessary. The one comforting thing in the situation is that the damage done by electrolysis is for all practical purposes confined to underground metallic structures of considerable dimensions. Foundations and superstructures, buildings, bridges, viaducts, and the like, are practically immune. Any current leakage sufficient to cause electrolytic trouble in such structures would quite certainly be sufficiently manifest locally to attract attention; and the remedy is then easy.

It is difficult to form a clear idea of the extent to which electrolytic damage really goes. When localized, it can commonly be recognized at once; but general injury is almost indistinguishable from that by chemical action of the soil and its contents. It is very likely that such minor damage is comparatively common, although of so trivial a character as to be practically negligible.

BRIDGE LIGHTING BY INCANDESCENT GAS.

A recent number of "Progressive Age" contained an account of a successful piece of incandescent gas lighting carried out by the Welsbach Company of Gloucester (N.J.) on the Sharpsburg and Lawrenceville Bridge—a large steel structure spanning the Allegheny River between Pittsburg (Pa.) and Sharpsburg, and carrying three electric lines and a great amount of pedestrian traffic. The following particulars of the work were furnished by Mr. W. B. Patterson, a salesman in the Pittsburg Department of the Company.

This was the first bridge in the district to be lighted by gas; and great difficulty was experienced in securing the order. The officials of the Bridge Company at first refused absolutely to have anything to do with the proposition, because they did not believe it feasible. But after many interviews with the toll-takers and the Bridge Superintendent, the higher officials began to show interest, and finally gave their permission to make a demonstration, providing they did not incur any obligation, and that all materials were removed in case the trial was not satisfactory. Two Welsbach gas "arc" lamps were accordingly placed on the bridge, at certain points designated for trial.

The plans and specifications for the piping of the bridge required that the main feed-pipe should be of 2½-inch iron pipe extending over the full length of the bridge (no reductions at either end being allowed); an expansion section, permitting of not less than 12 inches contraction or expansion, to be placed in the centre of bridge where the two sections of the structure were joined and rested on the centre pier, and where expansion and contraction to the extent of 7 inches are shown by marks on the bed-plates.

The lighting of the bridge was finally accomplished with ten Welsbach "arc" lamps, hung in the centre of the bridge between the tracks, 20 feet high, and approximately 190 feet apart. The lamps are lighted and extinguished simply by opening or closing the main valve on the bye-pass which is placed convenient to the occupant of the toll-house. This house is situated one-fourth the distance of the length of the bridge, or 480 ft. 4 in. from the end lamp on the Sharpsburg side, and 1440 ft. 8 in. from the one on the Pittsburg side.

Noting the great distance from the end lamp on the Pittsburg side to the toll-house, it might not seem possible that all the lamps could be lighted instantly when the main valve was opened in the toll-house; but this is the case. This fact much pleased the owners of the bridge, as well as a considerable number of gas men in the district, who thought such a device could not be made to work satisfactorily on a pipe-line extending a distance over 1921 feet, and supplying ten "arc" lamps.

This installation of the Company's lighting system displaced seven electric arc lamps; reducing the cost, and giving a much better and more steady light, and, moreover, one that does not go out. The objections to the electric lighting system formerly used on the bridge (which, however, were not spoken about until after the Company had completed their installation) were: First, the electric light occasionally went out, leaving the bridge in total darkness for as long as five minutes at a time; secondly, the light from the electric arcs was not sufficient; and, thirdly, it was too expensive.

The installation was completed about four years ago, and has been in operation ever since, giving entire satisfaction. During the whole period it has been on the Company's maintenance service; and they expect to retain it for an indefinite length of

time. Mr. Patterson says the word "satisfaction" in this particular case means more than the ordinary use of it, when one takes into consideration the fact that these lamps are suspended from the structural steelwork, 100 feet or more from the surface of the river, practically in the open. The heavy storms that pass up the valley the greater part of the year make this the severest test possible.

The following is the comparative cost of the lighting per month:

Seven electric arcs, for current and maintenance		$56
Ten Welsbach "arc" lamps, for gas	$20	
For inspection and maintenance	12	
Making a total of		$32
Or a saving to the Bridge Company of		$24

This figure includes gas for lighting and heating the toll-house. The cost of the installation was $572. It can readily be seen that the saving of $24 per month to the Bridge Company would enable them to pay off the first cost in two years, and in addition to this receive what they acknowledge to be much better service.

Since the Welsbach system was installed on the bridge, the Bridge Company have purchased lamps and other equipment for their bridge at Charlestown (W.Va.), which is stated by Mr. Patterson to be equally satisfactory. The Welsbach Company have also equipped the Pennsylvania Railroad bridge, for which they have an inspection and maintenance contract, including the lighting and extinguishing of the lamps. Electric lighting was objected to, because of the danger of the steel bridge being charged with electricity.

PAINTS FOR IRON AND STEEL WORK.

The members of the New York Section of the Society of Chemical Industry had before them early in the present year the results of some investigations carried out by the United States Paint Manufacturers' Association on the subject of the durability of paints. Towards the close of 1907, the Association erected at Atlantic City (N.J.) a long wooden fence on which were placed 560 panels of wood of three grades—white pine, yellow pine, and cypress. Upon the panels were painted a series of 47 paints, made from both single and mixed pigments, most of them being applied in three colours—white, yellow, and grey. The fence was under the direction of the Scientific Section of the Association, while the Master Painters' Association of Philadelphia had control of the actual painting work. The Sub-Committee on Protective Coatings of the American Society for Testing Materials agreed to inspect the fence, and their representative was present throughout the work. A year after placing the painted panels upon the fence, an inspection was made by the various Committees interested in the test. At the same time a similar fence was erected at Pittsburg, in the grounds of the Carnegie Technical Schools. It was under the same direction, and the master painters of Pittsburg did the work. The Carnegie Technical Schools' Fence Committee supervised the operations, and assisted in preparing the report after the painted fence had been exposed for a year. Several fences were also erected at Fargo, in the grounds of the North Dakota Agricultural College, and placed under the supervision of Dr. E. F. Ladd, the State Food Commissioner. The principal features of the reports on the tests are given in the current number of the "Journal of the Society of Chemical Industry," from which we extract the following particulars, in regard to paints used for iron and steel work.

Searches into the nature of these paints enabled certain rules to be formulated as to the value of pigments for coating iron and steel. The tests were made upon 50 pigments largely used in the production of paints, in order to determine which possessed stimulative, which inert, and which inhibitive characteristics when in contact with steel in the presence of water. The results were given in a report on "The Preservation of Iron and Steel," by Dr. Allerton Cushman, issued by the United States Department of Agriculture. It was too early to make a report upon the value of the various pigments at the close of 1909, but the following are a few observations thereon: The white leads (corroded and sublimed) and zinc oxide pigments appear to have well protected the steel and iron. The pure white leads showed a tendency to early and heavy chalking; but the steel beneath seemed in good condition. The zinc oxide showed a tendency towards checking and cracking, possibly because insufficient oil was used in its grinding. Zinc oxide mixed with silica or white lead gave efficient protection. The red iron oxides applied to the steel plates seemed to have done very well, with the exception of Venetian red, on which there seemed to be a slight exudation of the calcium sulphate contained in it.

The plates painted with red lead were in excellent condition, as were also those painted with zinc chromate and zinc and barium chromate. In the case of the plates painted with zinc chromate, several abrasions made at the time of erecting the fence disclosed the clean steel plate, which had suffered practically no corrosion. This was presumably due to the fact that zinc chromate, being slightly soluble, had kept the abraded places in a passive state. The plates, which were primed with various inhibitive pigments and topped with the same second coat, showed that red lead or zinc chromate are the safest pigments to use for this purpose.

The plates which were coated with red lead, and second-coated with bitumen and coal-tar paints, disclosed a marked cracking of the top coats, through which the red lead used as a prime coater could be distinctly seen. Unequal expansion of the two coats was partly responsible for this fault, as well as the action of light upon coal-tar paints.

The appearance of the plates painted with Prussian blue was perfect. The paint was in most excellent condition, and possessed a very high gloss; thus demonstrating the value of ferrocyanides as excluders of moisture and retarders of oxidation. The plates painted with calcium sulphate (gypsum) showed the most marked corrosion; brown oxide of iron working itself completely under the coating. Calcium carbonate and barium sulphate when used alone were in very bad condition; early chalking and destruction of the film having taken place.

The samples of steel which were exposed unpainted after having been pickled, showed varied degrees of corrosion; those containing manganese and other impurities, either in small quantity or regularly distributed, being corroded evenly and without any marked pitting. However, on the plates which were exposed unpainted, but having the mill-scale, there was more rapid corrosion and also more pitting than on those not having the mill-scale. In fact, certain of the plates having the scale corroded in some spots in an extremely rapid way, leaving whole areas with the mill-scale unacted upon. The scale in this case would act as a surface upon which the hydrogen evolved during the electrolytic action which accompanies corrosion could be catalyzed to form water—thus allowing the corrosion to proceed very rapidly.

Wherever an abrasion appeared upon the paint coatings of the various panels, different results were noted. In the case of panels painted with certain stimulative materials, abrasions showed that progressive corrosion had proceeded, and pitting was evident; while with the panels painted with high-power inhibitive materials, the steel was in very good condition.

One of the most striking results of the tests is the effect on the life of a paint of the addition of a very small percentage of colour (lampblack, chrome yellow, iron oxide, &c.). The North Dakota tests showed marked improvement in the wearing of white leads, tinted yellow or grey, over that of untinted leads. The results of the tests at Atlantic City and Pittsburg confirmed this in the case of whites composed of lead and zinc. The only whites approaching the wearing value of the tinted whites were certain mixtures of lead and zinc, generally with a small percentage of inert pigment added. Thus the wearing value of a paint appears to be dependent upon its containing more than one pigment.

An addition of siliceous pigments appears to be valuable in increasing the wearing properties of paints. It is well known that corroded white lead acts upon linseed oil; but such paints may be made comparatively inactive towards the oil by grinding with them an inert pigment. This explains to some extent the action of ochre, silica, barytes, lampback, and chrome yellow.

The ability of certain pigments to absorb, and of other pigments to prevent, the passage of ultra-violet rays, no doubt has some bearing upon their action in a paint. The reflection of light by white paints might tend to preserve any delicate colours underneath them; while black paints have the contrary effect. Black pigments—such as lampblack and carbon black—are very slow driers, and tend with linseed oil to form films which are for some period excellent excluders, remaining quite elastic and durable. The chemical and heat rays of the sun, absorbed according to the selective action of the pigment, undoubtedly have some effect upon the drying and longevity of the oil.

Delicate pigments, such as Para red and others, need care in the selection of foundations. Canadian and British painters often add red lead to the white lead used in the priming of wood, as a better base than white lead alone. Some experiments made in the United States indicate that a combination of lead and zinc, with a small percentage of mineral pigment, gives the best results.

Removing Hydrogen Sulphide and Carbon Dioxide from Illuminating Gas.—A German patent has been taken out by Herr H. Hirzel for a process for effecting the above-named object. According to an abstract of the specification which appears in the current number of the "Journal of the Society of Chemical Industry," the patentee points out that in the removal of hydrogen sulphide and carbon dioxide from illuminating gas by washing it with ammoniacal liquor, in order to avoid loss of ammonia, only the liquor which is produced from the gas by condensation (so-called weak liquor), and which contains most of the hydrogen sulphide and carbon dioxide removed from the gas, is treated in a column apparatus for the expulsion of these impurities. In order further to reduce the loss of ammonia, the upper part of the apparatus, where the liquor is introduced and cooled, is made deeper than usual. The higher hydrostatic pressure thus produced leads to a better exchange of heat, and also increases the boiling-point of the liquor in the lower part of the column—thus facilitating the expulsion of the hydrogen sulphide and carbon dioxide. The same cooling water is used for cooling the freshly introduced gas liquor in the upper part of the column, and then for preheating the liquor in the middle portion before it passes to the lower heating compartment of the column; and thus economy of fuel is effected. An automatic temperature regulator is fixed on the inlet-pipe for the heating steam, so that the temperature of the liquor in the heating compartment can be kept constant some degrees below the boiling-point. The heating-tubes in the lowest compartment of the column are made separate and interchangeable, so that they can be easily replaced by others.

REGISTER OF PATENTS.

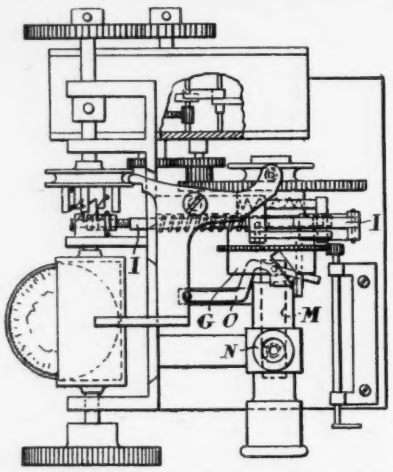
Prepayment Gas-Supply Apparatus.

HANSFORD, J., of New Barnet, and WRIGHT, J. F., of Aston, Birmingham.

No. 10,934; May 8, 1909.

This invention relates to prepayment apparatus (for the supply of gas, electricity, or the like) of the type in which, after the insertion of a coin of the proper denomination in the coin-carrier, the rotation of the coin-carrier spindle effects the coupling therewith of clock mechanism and the continued rotation of it winds the spring of the clock.

In the construction applied to controlling the supply of gas, the coin during rotation in a carrier on the actuating spindle displaces a spring-urged lever by which the winding clutch is brought into operation, and simultaneously a clutch connecting the timing disc with the clock is disengaged, while a crank on the boss of the winding clutch displaces a spring-urged frame or rod, so as to turn the timing disc through a definite angle by means of a pawl mounted on the rod which co-operates with a ratchet on the timing disc. The valve spindle is simultaneously displaced to turn on the supply by the engagement of a pin on the spindle, or its equivalent, with a cam or tappet on the timing disc.



Hansford and Wright's Prepayment Gas-Supply Apparatus.

The gas supply arrangement differs but slightly from the electrical apparatus. The gas-supply cock (as shown) consists of an axially movable piston valve M having a transverse passage, which, by the movement of the valve, is brought into and out of register with a corresponding opening or openings in the gas supply or delivery pipe N. The valve is shifted from one position to the other through the medium of a lever O pivotally connected with the valve. In the initial position of the apparatus—*i.e.*, when the valve is closed—the end of the lever is within and at the bottom of the slot shown; but when, after the insertion of the coin and on rotating the coin drum, the timing drum G is rotated on retraction of the rod I, the first part of the movement of the timing drum shifts the end of the lever out of the slot, thereby opening the valve, which remains open during further rotation of the drum—the end of the lever resting on the edge of the drum. When the drum is returned towards the initial position by the clockwork, as the quantity of gas paid for is nearly consumed, the end of the lever is engaged by the other edge of the slot, the edge of the drum G being extended at this point (as shown), to ensure engagement between the lever and the inclined surface of the disc or drum. The rear face of the projecting part of the rim of the timing disc G serves as a stop to prevent the disc being rotated more than a complete turn.

Any clockwork mechanism may be used to drive the switch or timing disc; but it is preferred that the mechanism should comprise an escapement which will enable the mechanism to start as soon as the torque is applied to the escapement wheel spindle—for example, as soon as tension is put on the driving spring, whatever the position of the escapement. With this object, the escapement wheel is preferably (as described in patent No. 10,935 of 1909) in the form of an equilateral triangular disc, and one arm of the anchor is crooked or set obliquely (much in the usual manner) to engage the angles of the escapement disc, so as to retard the latter until freed by the action of the balance-spring or its equivalent; while the other arm has its operative surface so formed that, as soon as pressure is applied to it by the escapement disc, the anchor is displaced thereby against the action of the balance-spring—that is to say, the operative surface of this arm of the anchor is such as to present a slight incline to the path of the corner or angle of the escapement disc for all positions of contact between them.

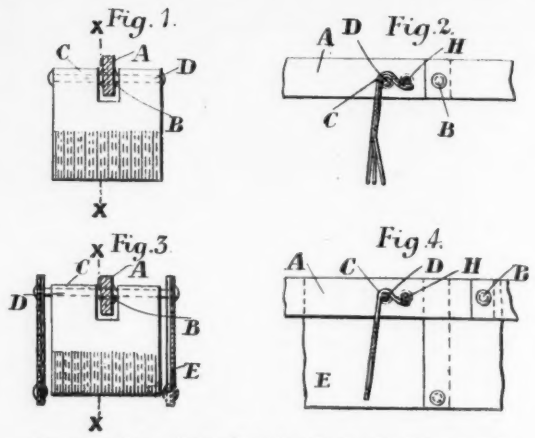
Charging and Discharging Gas-Retorts, Coking Ovens, &c.

MASTERS, E., of Palace Chambers, Westminster, and HANSFORD, J., of New Barnet.

No. 13,428; June 8, 1909.

This invention relates to apparatus for charging and discharging gas-retorts of the character described in patent No. 9057 of 1909, and consists essentially in improvements in the construction of the charging element, the principal feature of which is the substitution of brushes for the push-plates then described.

These brushes may be carried by a jointed bar which, in operation, is advanced centrally along the retort with the brushes depending sufficiently to sweep the floor of the retort. The brushes are mounted at intervals on the jointed bar, so as to be free to swing forwards; but they are prevented from swinging backwards beyond the vertical position by means of stops on the bar which encounter the brush mountings or suitable projections thereon. The charging member may have side plates jointed in correspondence with the central bar, and forming the sides of the brackets or boxes into which the coal is charged from a hopper or shoot; or the side plates may be dispensed with, in which case the counterweighted apron plate and charging platform co-operating with the charging member, and which are carried by the charger-frame in front of the mouth of the retort (as described in the earlier patent), are provided with side plates so as to complete the receptacle for the coal as it is delivered on to the charger from the hopper or shoot.



Masters and Hansford's Charging Member for Gas-Retorts.

Fig. 1 is a side elevation of a charging bar and brush without side plates. Fig. 2 is a section on the line X in fig. 1. Figs. 3 and 4 are corresponding views of a charging member provided with jointed or hinged side plates.

A is a bar comprising a series of links hinged together at B. The brushes comprise a plate provided with a foliation of wires or tongues, and either pivoted or hooked at C on to arms D integral or attached to the bar A, as shown. But where side plates E are used, the brushes are preferably hooked to distance-pieces connecting together the two rows of side plates. The side plates, where used, comprise a series of short lengths of plate hinged together in the usual way.

For controlling the swinging movement of the brushes, which normally are suspended in a vertical position, back-stops H are adapted to engage a surface of a brush in the desired limiting rearward positions.

The charging and discharging operations are performed in the usual way—that is, coal is shot between the brushes, and as these are caused to travel forward they push the coal in front of them and sweep it into and along the floor of the retort; while as the bar carrying the brushes is withdrawn, the brushes swing up and pass over the surface of the coal deposited in the retort.

Dip-Pipes.

PARKER, C. H., of Wednesfield.

No. 18,455; Aug. 10, 1909.

This invention relates to dip-pipes for hydraulic mains, of the type wherein the tubular valve part surrounding the dip-pipe may be lifted clear of the level of the liquid in the main or lowered so as to make a liquid seal when it is necessary to cut off particular sets or "bunches" of retorts, as when charging and discharging them. The invention has for its object to permit of access to the tubular valve part for the purpose of cleaning, by the provision of a supplementary casing separate from the casing carrying the dip-pipe and valve, and capable of being readily detached from it. The supplementary casing carries the valve lever and spindle of the valve lever; and thus, on the removal of the part referred to, the spindle of the valve lever and the valve lever itself are completely removed, so as to permit of access to the valve without the necessity of removing the dip-pipe, ascension-pipe, or the casing on which the dip-pipe is mounted, and within which the top of the valve is carried.

The fitting A (p. 727) is secured to the top of the hydraulic main B with a flange at its upper part to receive the flange of the dip-pipe C; the latter being also provided for the reception and connection to it of the flange of the ascension-pipe D. The fitting A is provided with a seat for the enlarged top part of the tubular valve E when the latter is allowed to assume its lowermost position; and at the side of the fitting is an aperture of a width corresponding to the width of the top of the valve, and through which may pass a bifurcated lever F, whose arms extend one upon each side of the top of the valve, and are provided with projections for entry within, or engagement with, an annular channel or recess provided upon the valve.

The bifurcated valve lever F is mounted upon a spindle G transversely disposed to the axis of the valve; and its extremities are mounted within a supplementary casing adapted to cover the aperture through which the lever F passes. Flanges or lugs are provided around the aperture in the casing of the dip-pipe and valve for the reception of bolts or screws, which are screwed into flanges or lugs on the supplementary casing carrying the spindle and the valve lever, so

MAINTENANCE.

FIG. 1.

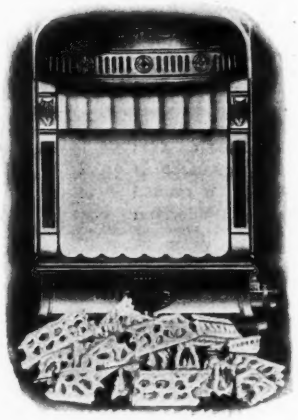


FIG. 2.

FIG. 3.

THE latest achievement to warrant our familiar slogan is hereby introduced to the Gas Engineers of the kingdom.

It is our Patent "Pyro" Fuel reinforced, in combination with a Brick of very unique construction.

Our Special "PYRO" Fuel, so successful last season, has been still further improved in composition and shape. It is an axiom that a highly efficient gas fire fuel MUST BE LIGHT, therefore fragile. Hence it is liable to fracture after being in use some little time. When the fuel is in use, the front and back surfaces will be at different temperatures, resulting in uneven expansion and contraction, and liability for cracks to develop. These difficulties are overcome by means of our special and Patented Fuel.

Reinforced "Pyros" are used in conjunction with A TWO-PART TOP AND BOTTOM SLIDING BRICK (which we shall deal with further in another issue), and the first illustration on this page shows how simple is the operation of placing in position or removing the fuel.

Figure 2 shows eight Reinforced "Pyros" which have been very badly fractured, but owing to the reinforcing wires and the Special Two-Part Brick, these identical pillars were quickly and satisfactorily replaced in the fire in the manner illustrated in figure 3. This demonstrates that the fuel pillars, broken in such a way as to be otherwise absolutely useless, are practically as good as new owing to the combination of our two important new features.

There is an actual increase in the radiating surface of the new "PYRO" pillars, and, owing to their special composition and shape, we claim for them GREATER RADIATING POWER than any fuel hitherto introduced.

DAVIS

Gas Stove Co., Ltd., Luton.

SHOW-ROOMS:

LONDON: 59, Queen Victoria Street, E.C. MANCHESTER: 4, Victoria Arcade, Deansgate.

Section showing the construction of the D.S.O. Series of "Main" Gas Fires with their one-piece casting, solid-back fuel and other important advantages. Note how the fuel is held securely by the casting and the top brick.

Our new fuel is by far the most notable advance in Gas Fire construction for the last ten years.

Section showing how, by simply raising brick at top of fire, the fuel can be taken out or inserted. Note that bars are dispensed with entirely, also how the new fuel tapers to fit the flame.

BESIDES being fitted with this new patented fuel, our D. S. O. Series of Gas Fires for the 1910-11 Season are unique in another respect—*they are cast in one piece.* These two features make the "Main" Gas Fires such a radical improvement on the present types of gas fires that there can be no comparison between the two in point of simplicity, efficiency, and heating power.

Here are just a few of the advantages of our D. S. O. Series:—

(1). Fuel practically unbreakable.

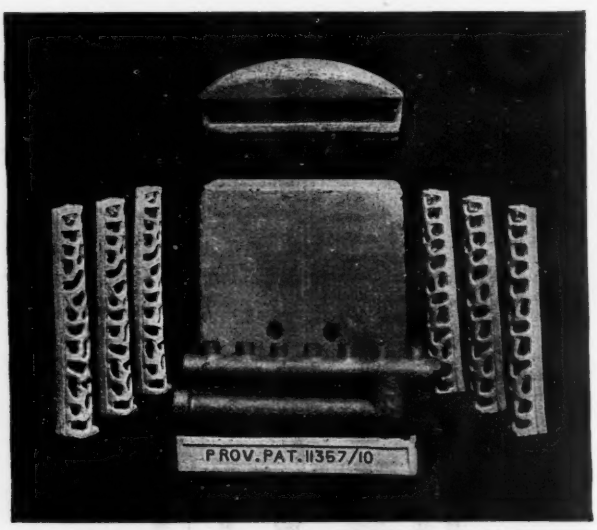
(2). Fuel cannot fall out—it is held securely by casting and top brick.

(3). Solid-back of the fuel causes the utmost amount of heat to radiate to the front of the fire.

(4). No bars to obstruct the heat.

(5). The top brick has a chamber through which the hot gases pass before they reach the flue—this gives the flame time to render the fuel properly incandescent without drawing it straight up through the flue.

(6). The few loose parts—nothing to go wrong—see illustration below.



"A Casting . . . . a Burner . . . . Two Bricks . . . . and 'Main' Solid-back Fuel . . . . . THAT'S ALL."

GOTHIC WORKS
ANGEL ROAD
UPPER
EDMONTON
LONDON
N

R. & A. MAIN, LTD.

Cooking and Heating Engineers,

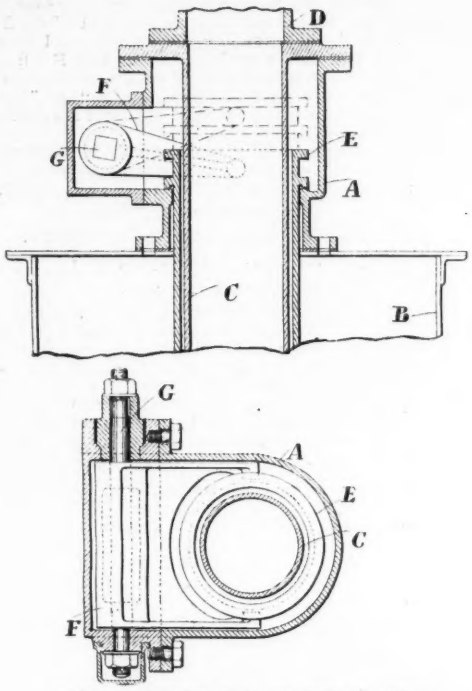
25, PRINCES STREET, OXFORD CIRCUS

. . . . . LONDON, W. . . . . .

GOTHIC IRON WORKS
FALKIRK, N.B.

136, RENFREW STREET
GLASGOW

that the supplementary casing is capable of being readily mounted in position and as readily disconnected for the examination and cleaning of the valve.



Parker's Adjustable Hydraulic Main Dip-Pipes.

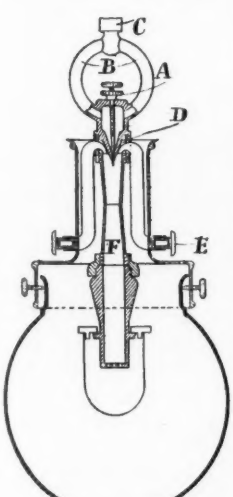
In order to render the casing gas-tight, the fitting mounted upon the spindle G, and provided for the reception of an operating lever, is formed with a valve-like surface adapted to bear upon a corresponding valve seat formed in the supplementary casing, and the nut is screwed down upon a washer; while at the further end of the spindle there is provided a small cap mounted to cover the spindle nut, or alternately a stuffing-box through which the spindle passes.

Inverted Incandescent Gas-Burners.

RAYBURN, E. C., of Edinburgh.

No. 16,699; July 17, 1909.

The gas is supplied through a nipple A, in which is a central vertical direct-acting needle regulated by being screwed up or down. The gas is supplied by two branch-pipes forming a circular suspension link by which the burner is carried. The gas is heated by the products of combustion impinging against the branch-pipes; and for the purpose of more effectually heating the gas, these branch-pipes may be made to dip into, or lie close to, the top of the funnel forming the top of the gallery B. The gas from the nipple is delivered centrally and vertically downwards into a closed tube C of fairly large diameter; and passing into the tube are one or more air inlet-tubes D, tapered at the ends which lead into the closed tube, or gradually flattening to an ellipse. In any case, the tubes are of greater cross-area where the air comes in than where it passes in to mix with the gas. Where the tubes enter the gas-chamber C, they are bent more or less downwards, so that the air is delivered in streams downwards and towards a common centre. Attached to each air inlet-tube, and at a point where the heat is comparatively great, is an air-heating chamber E provided with an air regulating valve. The air inlet-tubes pass out through the gallery B. In the head of the burner, directly underneath the delivery ends of the air tubes, is a bunsen tube F, tapered as shown, somewhat like the well-known "*vena contracta*" form of outlet-pipe. The chamber or nozzle immediately beneath the bunsen tube is provided with a perforated diaphragm which "adds materially to the efficiency of the lamp." To the lower end of the nozzle are the usual projections for carrying the mantle.



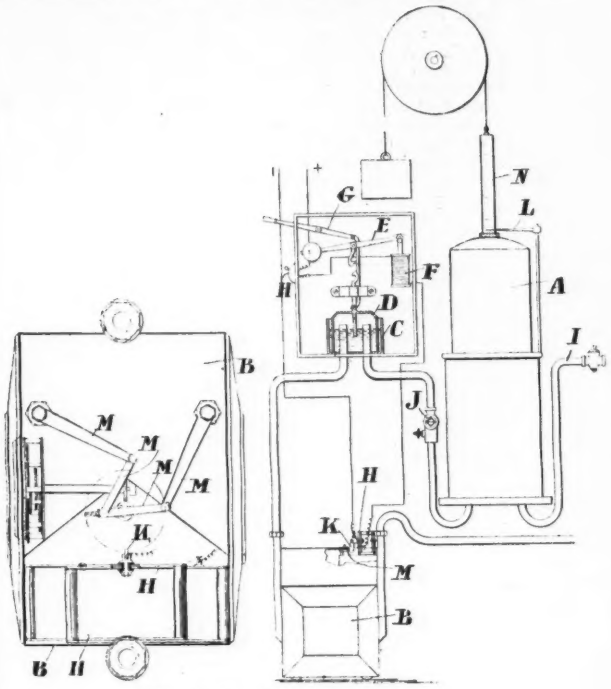
Rayburn's Inverted Incandescent Burner.

Testing the Capacity of Gas-Meter Diaphragms.

GLOVER, T., of Queen Victoria Street, E.C.

No. 19,031; Aug. 18, 1909.

This apparatus is for testing the capacity of the diaphragms, bellows, or other measuring appliances of a gas-meter by causing either of the actuating arms or the tangent, or a stop or pin on the index-spindle, to establish an electric circuit on each revolution or complete movement to immediately shut off the supply of gas to the meter.



Glover's Gas-Meter Capacity Tester.

The first illustration is a part sectional elevation of the complete installation; the second being a plan of a dry meter with the top removed.

Between the ordinary gas-bell A employed for testing purposes and the meter B is a mercury cup C, into which is led the gas-pipe from the bell, and from which is led the pipe to the meter. In the cup is a sealing bell D having a division plate which acts between the two gas-pipes; and on the sealing bell is a hook or hooked rod which engages with a hook on a rocking beam E, one end of which is connected to the core of a solenoid F. The lever G engaging with the hooked rod on the sealing bell is for lifting it out of the mercury cup. A spring-controlled folding frame, preferably of X shape, is positioned preferably within the top of the meter, as at H, and by its construction may fit many sized meters.

Now suppose it is wished to test a meter to find out the capacity of the bellows, the meter is connected up, and the gas-testing holder is filled from the pipe I, and the supply cut off. The frame H is placed in position—the meter with the depending pivot piece of the axle in the path of the actuating arm, tangent, or stop on the index spindle. This is then set; the bell D is lifted in the mercury cup to free the gas-pipes; the tap J is turned on; and gas passes from the gas-testing bell, and commences to fill the bellows in the meter. The electric current is then switched on; and as soon as the actuating arm makes contact with the depending pivot piece K, the electric circuit from the battery is completed and the core of the solenoid is operated to release the sealing bell D, which immediately drops and shuts off the gas. The meter mechanism is then stopped. The testing holder L is then set for the commencement of a reading; the depending pivot piece K is lifted from the path of the actuating arm M, or the stop on the index spindle, and the sealing bell is lifted by means of the lever G—gas passing through the meter. As soon as the actuating arm is moved away from its original position, the depending pivot piece K is dropped into the path of the actuating arm M, and the current is switched on. When the revolution is complete, the actuating arm comes against the depending pivot piece K, and electrical contact is again established, and the sealing bell shuts off the gas as before, stopping the meter, and the reading is taken by which the correctness or otherwise of the meter can be read on a scale N attached to the top of the holder.

Discharging and Charging Gas-Retorts.

DUCKHAM, A. M'D., of Little Bookham, Surrey.

No. 19,305; Aug. 21, 1909.

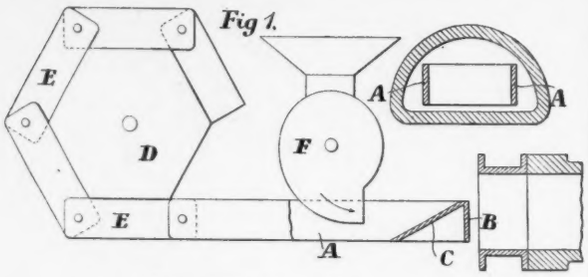
This invention relates to a machine adapted to discharge and charge a retort in the one cycle of entering and leaving it. The discharging device is constructed so that, while it is being withdrawn from the retort, the projector operates to fill the retort.

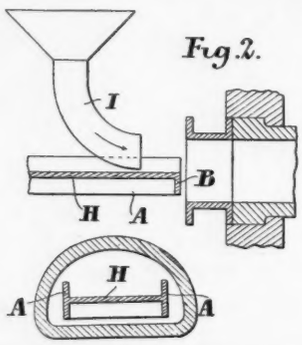
The machine comprises plates of suitable dimensions for entering the retort, and provided with a head to serve as a ram for discharging the coke. The projector may be of any known form involving rotary mechanism, or simply a vertical tube curved at the bottom, down which the coal falls—being projected into the retort owing to its own momentum.

Fig. 1 (p. 728) is a longitudinal section through the end of the retort and discharging device combined with a projector, with a cross section showing the discharging device within the retort. Fig. 2 is a part longitudinal section showing a modification.

In fig. 1, the discharging ram consists of two side plates A, joined together at their forward end B, and having between them at this end an inclined plate, which may be a web C, adapted to cause the projected coal to ride over the end. This ram is driven into the retort by

a polygonal drum D, which drives links E connected with the ram. The ram and projector F, which has rotary blades projecting coal from a hopper, may be carried by the same framework; and when they have been brought into proper position relative to the retort to be discharged and charged, the ram is first pushed into the retort to discharge the coke. A stop having then been arranged at or near the end of the retort from which the coke has been discharged, the ram is withdrawn a little way, and the projector is started in operation while the withdrawal of the ram is continued. The coal issuing from the projector runs along the bottom of the retort between the plates A, and shoots up the incline O over the end of the ram, and the retort is duly charged. This projector may occupy permanently its charging position relatively to the whole apparatus, since the end of the ram never has to pass the projector.





Duckham's Retort Charging-Discharging Device.

In fig. 2, the ram is slightly varied, in that there is a horizontal plate H between the side plates A and the end plate B, but only half the height of the side plates. In this case, the coal runs along the plate H instead of along the bottom of the retort, and no incline is required. The shoot I is assumed to be the lower end of a tube attached to a hopper; the coal descending the tube and acquiring sufficient momentum to carry it into the retort.

Gas-Fires.

AIRD, K., of Falkirk.

No. 23,482; Oct. 14, 1909.

This invention relates to gas-fires of the kind adapted to be fitted to existing grates, interiors, or fire places, "so as to be self-contained and give the appearance of an incandescent coal-fire." It consists of a gas-fire so arranged that the whole area of the fire-grate is "available for holding fuel, and is not lessened by the fitted-in structure occupying part of the fuel space."

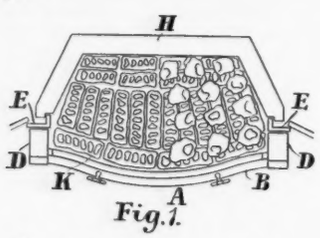
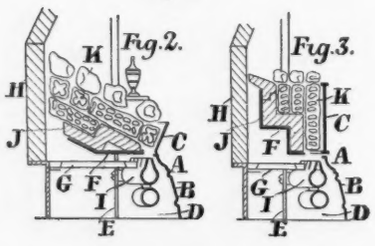


Fig.1.



Aird's Gas-Fire.

Fig. 1 is a plan, and fig. 2 is a vertical cross section of such a gas-fire. Fig. 3 is a vertical cross section showing a modification.

In figs. 1 and 2, the fire comprises a casting A resting on the hearth, and having an ornamental or other front B, with front grating C above; the grating being formed integral with the casting, or else detachably secured to it. The rear edges of the sides D are fitted against the forward edge E of an existing grate whose front bars have been removed; while a supporting base F, formed integral with the casting and grating (or detachably secured to it), is extended horizontally over the usual grate-bars G and upwards towards the back brick H of the fire place. In the hollow front part of the casting, a bunsen burner I for supplying gas is fitted; and over the rearwardly extending base F is fitted a fire-brick block J, having a sloping or stepped surface, on which are laid or built-up the hollow or like bodies K constituting the "fuel," the forward edges of which are supported by the front grating of the casting, which bars are kept unusually low.

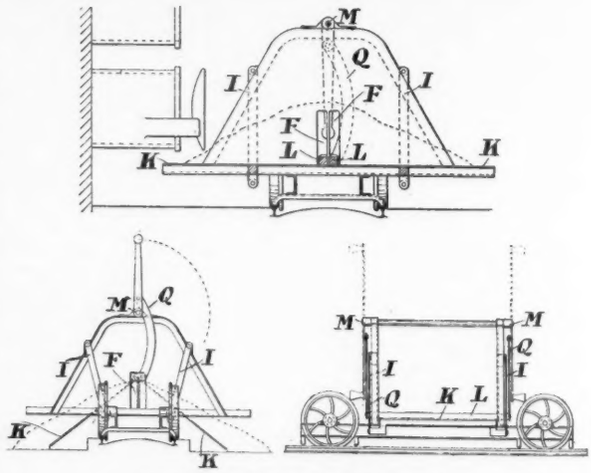
The construction shown in fig. 3 is substantially the same, except that a high front grating C is employed, and the rearwardly extending base F is stepped; the fire-brick block J being made to correspond.

Coke Trucks, Barrows, or Conveyors.

ROBERT DEMPSTER AND SONS, and TOOGOOD, H. J., of Elland.

No. 25,302; Nov. 3, 1909.

This invention, relating to coke trucks, barrows, or conveyors, is especially adapted to carrying away coke discharged from the bottom retorts of a setting of horizontal or inclined retorts, where vertical space is limited. It comprises flat bottomed or other trays or plates, pivoted at their centres of gravity (in determining which points due regard may be had to the weight of the coke borne), and linked to a toggle-jointed lever or system of levers in such manner as to be capable of tilting or rising in the centre of the truck so as to discharge their contents at opposite sides.



Dempster and Toogood's Coke-Trucks.

The truck as shown comprises two channel irons, on which are mounted four flanged wheels, and two horizontal angle irons supporting side frames. The space enclosed by these bars may be partially filled-in solid, leaving two guide-slots F at each side of the truck. Pivoted to the frames are swinging bars I, to the lower ends of which are connected cranked crossbars on which are secured flat plates or trays K, each constituting one-half of the flat bottom of the truck. Crossbars L, with cylindrical ends, are secured to the inner or adjacent ends of the two trays K and on their upper surface—working freely through the slots F. At the top of the frame is pivoted at M a handle linked to a curved lever Q, the lower end of which terminates in a double boss or bearing, in which work freely the round ends of the bars L. The handle is preferably in duplicate, so that the truck may be discharged from either end.

Coke having been discharged from the retort on to the trays K, and the truck having been traversed along the rails to the required tipping place, the handle is raised, causing the lever Q to draw the crossbars L to the tops of the slots F, when the trays K assume a sloping position, as shown, and discharge the coke, which, if not entirely discharged at once, slips or trails-off as the truck runs along. Upon the downward stroke of their handle, the plates K resume their normal position, and the lever Q is preferably taken past the centre line to lock in the loading position, ready to receive the next load of coke.

By reason of the cranked bars being pivoted to the bars I, they are free to turn outwardly when the inner ends of the trays are raised, whereby the required steepness of inclination of the trays for discharging can be readily obtained, in the minimum of available height; and, "owing to the balanced nature of the suspensory mechanism, the tilting is performed with the minimum effort on the part of the workman."

Lubricating Gas-Exhausters.

MASON, J., of Oakham, and MASTERS, R., of Dudley.

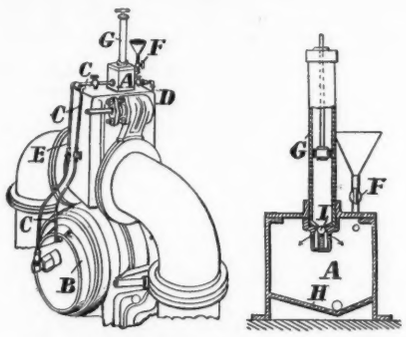
No. 28,111; Dec. 2, 1909.

This invention relates to means for oiling gas-exhausters, whereby from one common oil-receiver all parts will be oiled at one operation, "which can be performed quickly, without any danger of any of the oil being spilled."

A general view is given of a portion of a gas-exhauster showing the improvements applied to it, and a sectional side elevation through the lubricating apparatus.

On the top of the exhauster is a small enclosed oil-container A, preferably of somewhat larger capacity than is required to hold the oil for one oiling of the two end rings (in the covers B) and the central shaft. From the lower part of the enclosed oil-container there are two pipes C D

with controlling taps leading and connected to the oil inlets in the two end exhauster covers; and there is a branch pipe E with tap leading and connected to the oil inlet to the central shaft. The oil-chamber A has a filling hole, closed by a screwed plug-cock or the like F. In communication with the top part of the enclosed oil-container, there is a pump G adapted to force air into the oil-chamber on to the top of the oil in it.



Mason and Masters' Gas-Exhauster Lubricator.

The taps on the pipes leading from the oil-container to the oil inlets in the end cylinder covers and in the shaft are first closed, and a sufficient quantity of oil for one oiling of the parts is poured into the oil-container, which is closed at F. Air is forced by the pump into the oil-container on the top of the oil, and compressed to a suitable pressure. The taps are then all opened simultaneously, and the pressure of the air in A forces the oil along the pipes to the end rings in the covers and to the centre shaft simultaneously; the pressure of the air being such as to ensure the oil being forced into all parts to be lubricated.

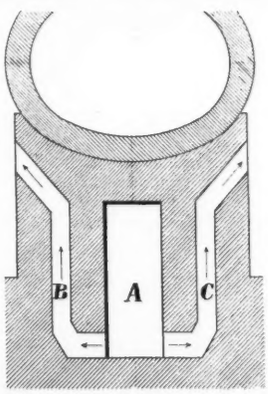
The lower portion of the container is preferably formed with an inclined or wedge-shaped bottom H, for the purpose of leading any small quantity of oil to the pipes, while the valve in the pump may be of the ball type—the ball I being pressed downwards by the air pressure from the pump G against the resistance of a coiled spring, the air being forced through holes in the lower part of the pump into the container.

Gas-Fired Retort-Furnaces.

BENNINGHOFF, O., and KLÖNNE, A., of Dortmund, Germany.

No. 826; Jan. 12, 1910.

This invention relates to a gas-fired retort-furnace of the kind wherein the available space is only sufficient to admit of a single gas passage for the heating of both sides of the furnace. In furnaces of this type, the patentees remark, it is difficult to adjust the chimney draught with such accuracy as to cause the heating gases to be equally divided between the two sides of the furnace—the side which has the greater draught naturally attracting more heating gas, and also more air for combustion. In order to prevent this air from being drawn back from the one side of the furnace through the gas-outlet flue into the gas-passage (thus causing back-firing therein, "which would injuriously affect the bottoms of the retorts") the gas-outlets are, in accordance with this invention, constructed as shown.



Benninghoff and Klonne's Gas-Fired Retort Furnaces.

A is the gas-supply passage or channel, from which the outlet flues B and C branch off on opposite sides. The flues for the combustible gas are on both sides arranged horizontally at the base of the gas-supply passage. Before, however, these flues reach the interior of the furnace, their direction is changed, so that they pass first vertically upwards in the side wall of the furnace to the level of the top of the passage A, and then obliquely outwards into the combustion chamber above this level. Should the draught not be uniformly distributed, it may happen that the heating gas is drawn more to one side than to the other in the flues B and C. With this arrangement, it is impossible for back-firing to occur in the pipe A, and injury to the furnace due thereto is thus prevented. But the columns of gas ascending in the flues B and C first vertically upwards through practically the entire height of the passage A, and then obliquely upwards and outwards, prevent the entry of air into the passage A, and thus obviate the risk of back-firing therein, and of consequent injury of the bottom of the retort.

To attain this result it is, however, said to be necessary—in order to provide ascending gas columns of sufficient height—that the gas should flow in the manner shown on each side from the bottom of the passage A, first outwards and then vertically upwards on each side throughout a height equal to that of this passage; and the arrangement here described and shown thus differs essentially from previously proposed arrangements, wherein the gas-flues branch off obliquely upwards from about the middle of the height of the main gas passage, or from the top or from one side only of this passage, or from the bottom of the flue A on one side, and at about the middle of its height on the other.

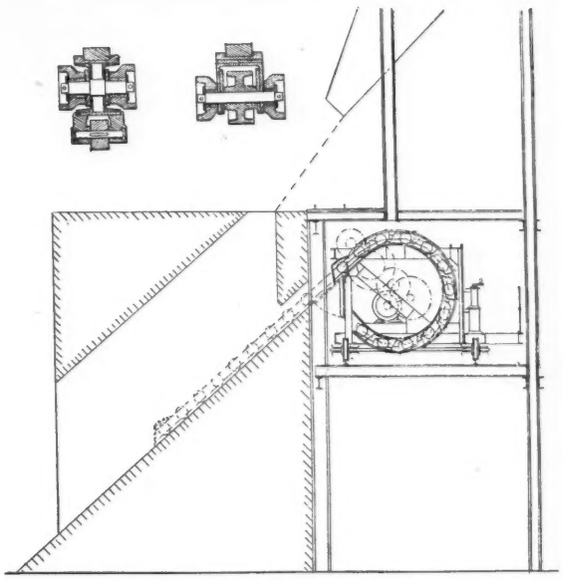
Discharging Machine with Jointed Ram for Horizontal and Inclined Coke Ovens or Retorts.

MULLER, W., of Saar, Germany.

No. 1286; Jan. 18, 1910.

In order that the necessary space for coke-discharging machines with rigid discharging rams (which must be as long as the oven or retort to be worked) may be reduced, and that the foundation masonry or brickwork for the track on which the machine is to move may be less expensive, machines of various forms of construction have already been suggested, the patentee points out. For example, in one well-known form of construction, the discharging ram consists of several sections which telescope with one another; and when introduced into the oven they are drawn out by a chain-gear so as to form a long rod. For the purpose of economizing in the masonry or brickwork, the whole device is placed on a high frame, which runs below on the level on rails.

The disadvantage of this form of construction, he points out, is that for extending the different parts of the discharging rod the sensitive chain-gear must be employed, and, further, the discharging ram and the machine frame are exceedingly heavy in construction. Moreover, forms of construction are known in which the discharging ram consists of a large number of small links or elements, which in operation slide along the bottom of the oven or retort, and are wound on a drum or the like, when the ram is drawn back. But a disadvantage in these rams is the sliding of the jointed ram along the bed of the oven, "whereby the latter is often damaged, the rams are quickly worn away, and a relatively considerable expenditure of force is necessary in discharging."



Muller's Jointed Ram for Discharging Ovens or Retorts.

The present invention is intended to enable the jointed ram to be operated in such a manner that these disadvantages are avoided. For this purpose, the links of the rams are provided with guiding and supporting rollers, which may be constructed in various forms, and two examples of which are illustrated. By the roller-guide arrangement for the links or sections, direct contact between the latter and the bed of the oven is avoided, and the links are easily guided in the guide-groove (or curved guide) when they are turned over. In this way, any premature wearing away of the links is prevented, and the consumption of power is very slight. The roller arrangements illustrated are intended to ensure a separate guiding of the ram in the oven and in the curved guides—the side-rollers acting as guide-rollers in the guide-curve of the machine; while the lower rollers act as supporting rollers for the links in the oven or retort.

In the main drawing, an example of the invention for discharging machines employed in inclined ovens or retorts is shown in connection with the roller-guided links of the discharging ram which are turned over downwards in a fixed guide-curve when the rod is drawn back.

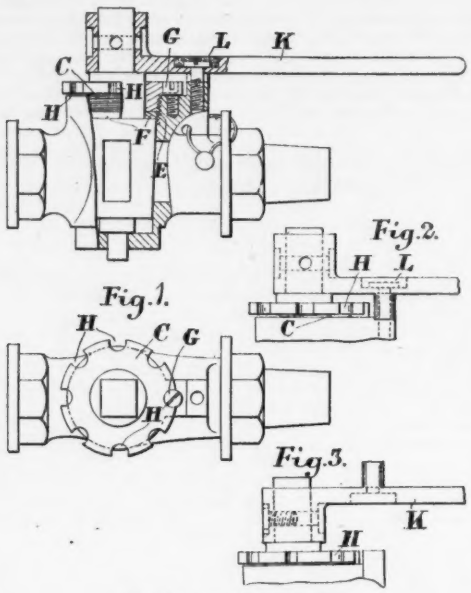
Controlling the Supply of Gas from Main to Meter.

CLARK, H. N., of Lewisham, S.E.

No. 5840; March 8, 1910.

This invention (relating to cocks designed especially for controlling the supply of gas from the main to the meter) has for its object an arrangement whereby more efficient means of locking the cock when the supply is cut off are obtained, and means are provided whereby leakage of the cock is prevented, and loss of the key or misuse thereof is obviated when the cock is in use. With a cock constructed in

accordance with the invention, the use of a cock on the consumer's side of the meter is dispensed with.



Clark's Gas-Meter Cut-Off.

Fig. 1 is a part sectional elevation and plan of the cock; fig. 2, a part elevational view showing the handle or key locked to the body; and fig. 3, a similar view showing the handle or key in the operative position.

The taper plug has its lower end fitting in a closed conical recess, and is provided with an extension which passes through the bottom of the recess. The cap C screws into the stuffing-box E formed in the body of the cock, and is locked in position after the washer F has been compressed on the top of the plug to the requisite degree by means of the screw G, which screws into the body of the cock, while its head takes into one or other of the notches H on the screw-cap. To prevent the gas-supply pipe from being disconnected from the meter, the screw union is locked to the body of the cock in any recognized manner—for instance, by a wire passed through a hole in the body of the cock and through the flange of the union; the ends of wire being sealed off.

The key or handle K has its boss fitting the stem of the plug, with lugs or projections formed on the key. The vertical extension formed on the body of the cock is adapted, when the handle is to be locked, to fit between the lugs, and when in this position, it is locked to the body of the cock by a screw passed through the recess in the key, and screwed into a hole of the vertical extension shown. The space above the screw-head is filled with any suitable seal L, thus rendering it impossible to operate the plug without tampering with the seal; and, further, as the holes for the screws are in alignment, it is impossible (when the cock is locked) to tamper with the screw cap C, unless the handle or key is removed.

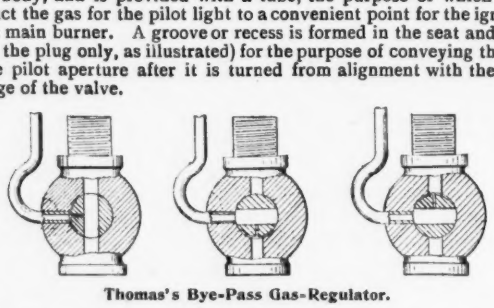
When the cock is required for use, the seal L is broken, the screw removed, and the handle reversed, as in fig. 3; the handle being then secured to the stem by means of a screw passed through one or other of the holes in the boss of the key, and screwed into the stem. In the same manner also, the handle or key may be secured to the stem when in the locked position.

Bye-Pass Gas-Regulator.

THOMAS, B., of Birmingham.

No. 5055; July 31, 1909.

In this invention, the plug of the valve, in addition to being provided with the usual straight cross passage, has a small aperture formed at right angles to it, in the one side of the plug only; the aperture being of a size to permit the passage of sufficient gas for the supply of the bye-pass or pilot light. A second port is formed in the valve body, and is provided with a tube, the purpose of which is to conduct the gas for the pilot light to a convenient point for the ignition of the main burner. A groove or recess is formed in the seat and plug (or in the plug only, as illustrated) for the purpose of conveying the gas to the pilot aperture after it is turned from alignment with the inlet passage of the valve.



Thomas's Bye-Pass Gas-Regulator.

It will be seen that when in the bye-pass position, as is shown in the second figure, the valve requires exactly one-quarter turn to turn the main burner full on—the bye-pass remaining alight; while a further quarter revolution completely closes the valve to the supply. Stops are provided in similar positions to the ordinary plain valve, thereby enabling the valve to be constructed from the usual type of body.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

High-Pressure Gas Lighting.

SIR,—To prevent possible misapprehension on the subject, may we ask you to allow us a few lines in the "JOURNAL" as to the early attempts made to produce mixtures of air and gas in mains before its entrance into service-pipes of consumers.

We do not claim that we were the first to apply this principle to incandescent lighting; the system of diluting gas with air is as "old as the hills." We have employed mixers in connection with our oil-gas apparatus for many years; and a number of these mixers are still in regular use throughout the country.

As long ago as March 24, 1884, an article appeared in the "Mechanical World" describing the application of this mixing or diluting apparatus, as applied by our Mr. James Keith. This conclusively proves that the principle of mixing air with gas before use is not novel.

From this, your readers will appreciate that there cannot possibly be any patenting of the "principle" of producing the mixture, but only in the different forms of apparatus by which the mixing is secured.

Farringdon Avenue, E.C., Sept. 10, 1910. JAMES KEITH AND BLACKMAN CO., LTD., A. COLLINSON, Manager.

Colonial Gas Development.

SIR,—Nothing is more noticeable at the present moment in the gas industry than the sudden springing-up of a demand for the latest and most efficient means of manufacture and distribution among the smaller townships and outlying districts of our Colonies. In Australia and New Zealand, this is particularly remarkable. It would seem as though there had been a thorough awakening to the fact that the best and most modern of appliances for all such purposes were not only advisable to keep pace with the times, but that they constituted in grim earnest the essentials which were absolutely necessary to the well-being and the welfare of each particular community. At the same time, existing works of ancient construction are equally imbued with this spirit of progress; and we are at the moment pressed with demands for the most up-to-date appliances for minimizing the cost of production, from widely divergent Colonial possessions. The following is an illustration of our argument:—

INVERCARGILL (N.Z.) BOROUGH COUNCIL.

GAS DEPARTMENT.

Comparative Analysis of Profit and Loss Account for Four Years Ending March 31, 1910.

—	Per 1000 Cubic Feet of Gas Sold.			
	1907.	1908.	1909.	1910.
Coal	35·78d.	33·76d.	33·82d.	27·41d.
Less residuals—Coke, tar, &c.	17·95d.	17·36d.	16·11d.	16·07d.
Net coal	17·83d.	16·40d.	17·71d.	11·34d.
Manufacturing and distribution charges, including wages, purification, management, wear and tear, printing, &c.	27·28d.	29·30d.	33·54d.	27·21d.
Net coal and working expenses	45·11d.	45·70d.	51·25d.	38·55d.
Capital charges, interest, &c.	22·10d.	18·19d.	16·01d.	16·29d.
Gross cost	67·21d.	63·89d.	67·26d.	54·84d.
Less gas, meter, and stove, and other net receipts	79·38d.	79·24d.	77·78d.	74·52d.
Net profit	12·17d.	15·35d.	10·52d.	19·68d.
Gross profit earned on loan capital	7·8 p.c.	7·7 p.c.	6·9 p.c.	11 2 p.c.

E. RABBIDGE, Gas Manager.

It is now some three years since we purchased and shipped sundry plant of modern and improved construction on a considerable scale to the Invercargill Municipal Gas-Works, in order to meet the increased output. But notwithstanding these necessary expenses, the works continued to pay, and pay handsomely; and now it is not so much a question of renewal and restoration, as of rebuilding the works on the most approved modern methods on a scale suitable to cope with the present increased needs, and also to provide for the large and ever expanding requirements of a rapidly growing community.

The above is only one of many such cases of which we have lately had experience; and it may be of interest as showing the energy with which the smaller townships are pushing advantageously to the front.

WM. COWARD AND CO., LIMITED.

91, Finsbury Pavement, E.C., Sept. 9, 1910.

Free Maintenance and Supervision.

SIR,—My Directors, having read your "Editorial Notes" and Correspondence for some months past upon this subject, decided, as from Aug. 1, to maintain and supervise free of cost all consumers' services, fittings, and burners, and to replace mantles when required.

The experience of my Board is that, owing to the neglect of consumers in keeping fittings clean and renewing mantles when required, on an average only from 65 to 70 per cent. of the illuminating efficiency

of the gas is obtained. This, my Directors think, leads to very numerous (and often unjust) complaints and dissatisfaction—thus leaving the door open for an opposition light.

My Board feel that by taking the whole control of supervision and maintenance into their own hands, the Company will be more than repaid by the increased satisfaction of consumers and consequent expansion of trade, to say nothing of maintaining gas as the only illuminant. My Board consider this subject one of the most import to gas companies of modern times.

A. W. FOSTER,
Secretary, Beechworth Gas Company.

Beechworth, Victoria, Aug. 8, 1910.

High-Pressure Gas Lighting for Textile Mills.—At the foot of the letter on this subject which appeared on p. 660 of last week's issue, the address of the writer, Mr. James Taylor, was given as the Hollinwood Gas-Works, Oldham, instead of the Mossley Gas-Works, of which he is now Engineer and Manager.

MISCELLANEOUS NEWS.

GAS AND ELECTRICITY AT MANCHESTER.

Special Joint Report by Officials of Both Departments—Unanimity as to the Basis for Rate-Aid.

At the Meeting of the Manchester City Council last Thursday, some discussion took place on the Gas Committee's minutes in regard to the supply of gas for cooking purposes where electricity is used for lighting. The Gas Committee desire that, in addition to the cooker, one light shall be placed in the kitchens of houses supplied; and at the previous meeting of the Council they had been requested to reconsider the matter.

Alderman GIBSON, the Chairman of the Gas Committee, said that the Committee adhered to their former conclusion. The matter was a small one; and why it was referred back, passed comprehension.

Alderman WALKER asked that the matter should be again sent back and referred to the Standing Joint Committee for consideration.

Alderman GIBSON, after a conversation with the Chairman of the Electricity Committee (Mr. Howarth), agreed to take the question back again, so that he could consult that Chairman.

Miss MARGARET ASHTON asked that the matter should be considered from the domestic point of view, and not only in regard to profits.

Alderman HOLT said that the question was a serious one. There was contention between two Committees as to who were going to supply a certain thing called light. The sooner the two Committees were joined together in one Light and Power Committee the better it would be for the city. They were now both contending for business; and they had no right to allow competition between the two departments.

The joint report of gas and electricity officials of the Manchester Corporation on matters affecting the relationship of the two departments is now in the hands of every member of the City Council. It is marked "confidential," and signed by the following: Gas—Mr. J. G. Newbigging, M.Inst.C.E., the Chief Engineer; Mr. Fredk. A. Price, the Superintendent and Secretary; Mr. F. P. Smith, the Accountant. Electricity—Mr. S. L. Pearce, the Chief Engineer; Mr. Fredk. E. Hughes, the Secretary; Mr. W. E. Foden, the Accountant. There is a supplementary report by the Electricity Department officials.

The following are extracts from the joint report: The prices charged by each of the respective Committees were considered at some length, with specific reference to the allegation that supplies were sometimes furnished below cost. Schedules of prices as submitted, giving dates on which they were approved by the City Council, are appended:

Gas.—By ordinary meter for general purposes, 2s. 3d. per 1000 cubic feet within the City, and 2s. 6d. without the City; authorized by the Council on May 3, 1903. By ordinary meter for manufacturing purposes on condition that the annual consumption for such purpose is not less than 1,000,000 cubic feet, 2s. within the City and 2s. 3d. without; authorized by the Council on March 7, 1906. By ordinary meter for power purposes, 1s. 9d. within the City and 2s. without; authorized by the Council on March 7, 1906. By automatic meter, 2s. 9d. within the City and 3s. 4d. without; authorized by the Council on May 4, 1898. Hire is not charged for either meters or stoves.

Electricity.—Lighting—ordinary: (*a*) simple or "flat" rate of 3¾d. per unit metered; (*b*) compound rate, consisting of—(1) fixed charge of £7 per k.w. of demand per annum. (2) *Plus* running charge of 1½d. per unit metered. Customers may take (*a*) or (*b*) at their option. These charges were approved by the City Council on June 3, 1907. Power—ordinary: (*a*) unrestricted supplies—from 0·7d. to 1·5d. per unit according to demand and consumption, subject to certain minimum charges; (*b*) restricted supplies (no current to be taken between 4 p.m. and 6 p.m. in November, December, January, and February), 1d. per unit, subject to certain minimum charges; hoists 1¾d. per unit, radiators and other small electrical appliances 1¼d. per unit. These charges were approved by the Council on April 6, 1910. Hire is charged on all motors supplied by the department. The report proceeds: We came to the conclusion that no arbitrary ruling could be laid down, as so much depended upon the conditions of supply and upon the different factors entering into each individual case. Further, we are convinced that all the prices of each department were fixed on recognized principles. We are unanimously of the opinion that no useful purpose can be served by one department criticizing the other, that if further criticism were desirable, nothing valid could be urged as to methods of working without a prolonged special study of the problems facing each department. As the situation presents itself to us, it is simply that the City Council has entrusted to the two Committees certain amounts of capital outlay, and that the Council exacts from each Committee annual sums in aid of rates. Such being the case, the question arises, on what common basis can a fair comparison be made. The outlay on permanent works (disregarding floating stocks) should form the first line of comparison. Allowance has to be made for the difference in the economic status of the departments. Owing to the Gas Department having been established many years longer than the Electricity Department, it has had time and opportunity to free a much larger proportion of its assets from debt than is the case with the latter department.

Adopting this basis of comparison, a table of figures is given showing that the capital outlay of the Gas Department at the 31st of March, 1910, was £2,851,184; the encumbered portion being £1,172,463, and the "free" capital—*i.e.*, capital upon which no interest is payable—£1,678,721. In the case of the Electricity Department, at the same date the figures are: Capital outlay £2,678,629, encumbered £2,001,430, and "free" £677,199. Charging these respective total capital sums with 3½ per cent. per annum, the hypothetical interest charges works out at £99,791 for gas and £93,752 for electricity. Deducting the actual interest charges borne—namely, £48,053 for gas and £69,311 for electricity—the respective benefits due to free capital work out at £51,738 for gas and £24,441 for electricity, or a difference in favour of the Gas Department of £27,297. Continuing the comparison, the report shows that, deducting the amount due to greater amount of free capital—namely, £27,297 from the £46,500 handed over by the Gas Department in aid of the rates for the year 1910-11—the percentage of rate aid to capital is 0·67 for gas against 0·56 for electricity, from which department £15,000 has been voted in aid of the rates for the current year.

The report goes on: Allowing for the probability of future gas contributions to rate aid being £50,000 (the normal figure for some years past), the gas percentage would be raised from 0·67 to 0·79, or £22,700—an excess over the electricity figure of £7700, or 23 per cent. On the electricity capital, this difference of percentage represents £6160.

Attention is called in the report to the recent decision of Parliament in regard to the Glasgow Gas Consolidation Bill—the gas undertaking being precluded from carrying any balance of profit to the credit of the Corporation for general purposes; and the following observations are made: It is quite clear, then, that if Manchester were now establishing its gas and electricity undertakings, no option would be given by Parliament as to the extent to which profits could be devoted to rate-aid. Equally clear is it that Parliament considers the benefit (if any) to accrue to the ratepayers must be calculated on the outstanding mortgage debt as being the only true measure of the ratepayers' risk. Applying the principle laid down by Parliament to the Manchester gas and electricity undertakings, the position in regard to rate-aid would be as follows:—

	Mortgage Debt as at March 31, 1910.		Amount of Rate Aid.
Gas	£1,212,685	..	£12,127
Electricity	£1,970,112	..	£19,701

The officials have considered how best to deal in the future with gas and electricity supplies to new colonies or estates where both supplies are demanded, and they report: As the ratepayers have a right to demand either or both supplies, provided an adequate return is assured to the Corporation on the necessary capital, it is held that the Electricity Department should continue exercising its powers of requiring an annual gross revenue of 20 per cent. on capital outlay on mains, and that the Gas Department should also demand a corresponding return. In the event of no adequate return being forthcoming for both departments from supplies to such estates, and failing a satisfactory arrangement between the departments themselves, it is suggested that such cases should be referred to a Standing Joint Committee, composed of representatives of each Committee and (say) the Finance Committee. The Joint Committee would not deal with all supply applications, but only those of the nature before mentioned. A Committee so constituted would necessarily consider the interests of the Corporation as a whole rather than those of either department. In conclusion, we desire to say that we are unanimously in agreement with parliamentary practice as to the mortgage debt being taken as the basis upon which rate-aid should be computed; and the adoption of that basis by the two departments would remove all grounds for criticism in the future.

The supplementary report by the electricity officials deals with the point that, after allowing for free capital, the contribution from the Electricity Department falls short of the gas contribution. The report says: "Taking the year 1910-11, the shortage is £2946. Had the gas contribution been at the normal figure of £50,000, the deficiency would have been £6160. As the gas contribution, judging from the experience of recent years, will probably remain at £50,000, and as the electricity contributions will at some time in the near future probably increase, the apparent shortage is in a fair way to disappear."

The Manchester Gas Committee have, in consequence of representations made to them by large consumers, appointed a Special Sub-Committee to consider the question of rearranging the charges for lighting purposes, and frame a scale of prices based on annual consumption. The Special Committee will include the Chairman and Deputy-Chairman of the Gas Committee, together with the Chairmen of the several Sub-Committees.

Metropolitan Gas Company of Melbourne.—The report of this Company for the six months ended June 30 states that, as the result of the recent coal strike at Newcastle, which terminated in March last, the items in the revenue account representing the cost of coal and the returns from coke are considerably higher than in past half years. The net profits, including £2210 brought forward, amount to £84,166. The Directors recommend a dividend at the rate of 5s. per share; leaving £2305 to be carried forward.

HARROW AND STANMORE GAS COMPANY.

Nearly Ten per Cent. Expansion of Business—Works Extensions.

The Half-Yearly Meeting of this Company was held on Monday last week, at the Holborn Restaurant—Mr. ALFRED H. BAYNES, J.P., in the chair.

The SECRETARY (Mr. J. L. Chapman) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN, in moving their adoption, said he ventured to think that the remarks he made at the last half-yearly meeting, as to the prospects of still further progress and prosperity, had been realized; for the report which was now before the proprietors proved that the results of the working of the past half year had been by far the best since the formation of the Company, and indicated very clearly the efficient management of their Engineer (Mr. Chapman). The increase in the sale of gas, as compared with the corresponding period of last year, was 9·63 per cent.; and the Stanmore portion of the Company's district of supply (which had been somewhat stagnant) was showing improvement, with an increased sale of 6·66 per cent. More lamps were being erected, and more gas used for public lighting. The public lamps showed an increased use of gas to the extent of 5·48 per cent. There were added to the connections during the half year, 195 ordinary and 225 prepayment consumers; and 260 new cooking-stoves had been fixed. The amount received for coke was less by £154 than at this period last year, due to the lower prices ruling—the difference being about 1s. per ton. On the other hand, the improvements made in the sulphate of ammonia plant last year were now showing good results. There had been an increased production, at less cost, the result being an improved profit on this residual of £113, which almost covered the loss due to the lower price of coke. Turning to the expenditure, though 164 tons more coal and 3730 gallons more oil had been used, there was a reduced cost of £175, owing to lower prices at which contracts stood during the half year. The item of repairs and maintenance of works was £605 more than at the corresponding period of last year; and of this sum, £500 had been written off disused small holders at the Stanmore works. The item of rates had increased by £210, due to new assessments in several parishes in which the Company supplied gas. The parliamentary expenses (£40) were on account of the new Standard Burner Bill; and the law costs (£137) were chiefly for expenses in connection with the alteration of one footpath and the closing of another on the land lately purchased by the Company. There had been an improvement in the quantity of gas obtained from the coal, and a decrease in the amount of oil used per 1000 cubic feet of gas in its manufacture. There had also been a satisfactory diminution in the unaccounted-for gas for the past half year. This stood at 2·09 per cent. of the total make; while at Christmas, 1909, it was somewhat heavy—being 7·43 per cent. This was largely accounted for by the considerable quantity of gas used by the prepayment consumers just at Christmas time, the coins for which it was impossible to collect until the New Year. The Company were beginning to feel the benefit of the larger mains recently laid, which enabled gas to be supplied at a more even pressure, with a full supply to all consumers. The new gasholder was now completed and painted, and was standing under air pressure at the present time. The earthworks for the railway siding to the works were so far advanced that there was now only the permanent way to be laid; so that in the course of next month the siding was expected to be used for traffic. The result of the half-year's working was that there had been an increase of £1699 in the receipts, and an increase in the profits of £653. The profit for the half year amounted to £6980. From this was deducted the debenture and the loan interest, amounting to £873; and, after the payment of the dividend and loan interest, there would remain a balance of £773. The sum available under the sliding-scale for the reserve fund was £458, leaving a net balance of £315 to be carried to the previous balance of £4569—making together a sum in hand of £4885. The reserve stood at £2254. In his judgment, the report now presented was a most encouraging one.

Mr. A. F. PHILLIPS seconded the motion, which was unanimously carried.

Proposed by the CHAIRMAN, and seconded by Mr. PHILLIPS, dividends were declared at the rates of 10½ per cent. per annum on the original "A" capital, £7 7s. per cent. on the additional "C" capital, and 7 per cent. on the additional "B" capital and guaranteed shares, less income-tax.

It was also agreed, on the motion of the CHAIRMAN, seconded by Mr. SAMUEL CUTLER, to add £458 to the reserve fund.

Mr. A. F. PHILLIPS, in proposing a vote of thanks to Mr. Chapman and his staff, remarked that the balance-sheet showed that the whole of their duties had been most efficiently carried out, and that the results were highly satisfactory. It was particularly pleasing to the proprietors to see that every half year the capital employed by the Company in relation to the quantity of gas sold still decreased. He admitted the capital was large; but still it was very different from what it was a few years ago. During the past half year, Mr. Chapman had had a great deal of additional work thrown upon him in connection with the diversion of a footpath, the construction of a new gasholder, and in bringing a railway siding into the gas-works. The last-named would be of inestimable benefit to the Company. Hitherto the whole of the coal had had to be carted to the works, and all the coke carted from them. When the siding was completed, the Company would be able to discharge the coal direct into the stores, and to load the coke direct into waggons.

Mr. F. LENNARD seconded the motion, which was agreed to.

Mr. CHAPMAN, in responding, said it was to him very gratifying to find that the Chairman's prognostications at the last meeting as to the Company's progress had come so true. Regarding those who worked with him, he had a very efficient staff, who put their whole soul into the work. They all took a personal delight in seeing the results come out as good as they could be.

Mr. F. R. SMITH, in moving a vote of thanks to the Chairman and Directors, said when it was considered that £600 extra had been spent in repairs and renewals of works, £450 added to the reserve fund, and the carry-forward increased, he thought the proprietors could truly say it was the best balance-sheet they could possibly have expected. The proprietors regretted very much the death of Mr. Horace Rydon, one of the Directors; but the Board had done the right thing in selecting Mr. Cutler—a most experienced gas engineer—for the vacancy. He (Mr. Smith) congratulated the Board and Mr. Cutler on the appointment.

Mr. PILLEY seconded the motion, and fully endorsed the remarks of Mr. Smith as to the late Mr. Rydon and the election of Mr. Cutler.

The motion was cordially passed.

The CHAIRMAN responded on behalf of himself and his colleagues. He thought they had every reason to be satisfied with the outlook; and he believed with Mr. Phillips that great advantage would be derived by having direct communication with the railway.

PROGRESS AT ILFORD.

The Ordinary Half-Yearly General Meeting of the Ilford Gas Company was held at the Offices on Friday, the 2nd inst.—Mr. WILLIAM ASHMOLE presiding.

The CHAIRMAN, in moving the adoption of the report and accounts, said the works had been kept in thorough order; and the summer alterations to plant now being completed, they were again ready to meet the winter's demand for gas. The works were thoroughly up-to-date—being able to cope with any increased business. As they had found, during the heaviest portion of the winter, the need of an extra tar-extractor, they were at present putting down a Livesey washer. This was being made, by men at their own works, out of two old purifier-boxes which were abandoned some time ago. It was capable of dealing with 2,000,000 cubic feet of gas per day, and was constructed with a mid-feather, so that one-half could be thrown out of use to allow it to be cleaned out. Work on the district had also proceeded satisfactorily; and the Company were fighting the keen electric competition with great success. A high-pressure installation of gas lighting for the outside of shops had been adopted in the High Street and Cranbrook Road, and had been favourably received by the shopkeepers—the general opinion being that it was better and more brilliant for their particular purpose than electric light. At their last half-yearly meeting, he had referred to the fact that Ilford seemed to have come to a temporary stop in the way of expansion; but this could only be for a time, as there was plenty of good building land in the market in the district, and he had no doubt within a few years another building boom would come along and open up this fresh land. Notwithstanding this slow expansion, it was very pleasing to be able to report an increase of 3·48 per cent. in the quantity of gas sold, compared with the corresponding period of last year. This 3·48 per cent. represented approximately 6,000,000 cubic feet. There was also another item on which the stockholders might congratulate themselves—the payment of the full statutory dividend for the past half year. The Board, recognizing that the Company were in a sound financial position, considered they were fully justified in recommending this. The Company, along with a number of others, promoted a Joint Bill to enable them to adopt the No. 2 "Metropolitan" burner, or what might be termed the standard burner, for testing the illuminating power of their gas. The Bill had not yet actually passed into law; but it was hoped that it would before the end of the year. The Bill was strenuously opposed before the Committee of the House of Lords, and also the Committee of the House of Commons, by certain local authorities who professed to be watching the interests of the consumers, but who in reality were acting as stumbling-blocks to the progress of enabling consumers to obtain cheap gas. It was a very remarkable coincidence that practically all the opposing local authorities were owners of electric light undertakings; and this, no doubt, accounted greatly for the opposition. With regard to the balance-sheet, the amount carried to profit and loss was £7780; being £922 more than in the corresponding half year. The employees had now received the co-partnership books containing their first year's bonus to the end of June this year; and he had no doubt that the scheme would be of lasting good, to the Company and to the workers. The expenditure under revenue account was greater than in the corresponding half year by £853; while the income exceeded it by £1775. The amount received from the sale of gas was £25,951; and rental of meters, stoves, fires, &c., had produced £3970. Residual products compared very favourably with last year's figures. The balance-sheet was one upon which they could congratulate themselves. The Company stood in a good position and on a sound financial footing. The capital expenditure per million cubic feet of gas consumed was lower to-day than it had been for many years past; and the stock of the Company was eagerly bought as a sound investment, and commanded a high figure on the market.

The report and accounts were adopted, and a dividend at the rate of £7 7s. 6d. per cent. per annum on the "A" and "C" stocks and £5 17s. 6d. per cent. per annum on the "B" stock (less income-tax) was declared. The meeting terminated with votes of thanks to the Directors, officers, and staff.

Woking Water Company.—Presiding at the meeting of the Woking Water Company, Mr. A. H. Baynes, J.P., remarked that the report and accounts constituted a record of satisfactory progress and prosperity. The capital expenditure of the Company now stood at £189,373, of which £3684 had been spent during the six months to June 30. The receipts from water-rentals during the half year were £8328, or an increase of £514 over the corresponding period of 1909. Nearly 120 million gallons of water were pumped; and there were now 6507 consumers on the rent-roll of the Company, as well as 617 meter supplies. A dividend for the half year at the rate of 5 per cent. per annum was declared; and at a subsequent extraordinary meeting, a resolution was passed sanctioning the creation and issue of £12,500 of 4 per cent. debenture stock and the reborrowing of moneys borrowed on mortgage.

MANCHESTER GAS SUPPLY.

Sixteen Years' Record.

From the Gas Department of the Manchester Corporation there has just been issued, in a tabular form, says the "Manchester Courier," a financial history of the gas undertaking of the city from the beginning of April, 1894, to the end of March, 1910—a period of sixteen years. In the year ending March 31, 1895, the price of gas per 1000 cubic feet to consumers within the city was 2s. 6d., to those outside the city 3s., and to remote townships 3s. 6d. Automatic consumers within the city got 25 cubic feet for 1d.; and those outside the city, 21 feet. The average price received was 2s. 6·81d. per 1000 cubic feet; the total number of consumers was 82,289; the mileage of main pipes was 724; and the output of gas totalled 3683 million cubic feet. Gas to-day within the city is 2s. 3d. per 1000 feet, and 2s. 6d. outside the city and in remote out-townships, with an average of 2s. 3·38d. per 1000 feet. The total number of consumers has increased by 96,853 to an aggregate of 178,490; while the output of gas has increased by 2033 million cubic feet to 5565 million cubic feet. In 1902, the reduced price of gas for power purposes came into operation, and was, in that year, 2s. and 2s. 3d. respectively to in-city and out-city consumers—being to-day 1s. 9d. and 2s. respectively. The department has now 938 miles of main-pipes, and has 49,948 cooking-stoves in use; whereas, in 1895, only 3379 were in use. In appreciating these, and subsequent figures, it should be borne in mind that electricity was first of all supplied by the Corporation in 1893, that meter-rents were abolished within the city in 1895 and outside the city in 1898, while the charge for the hire of gas cooking-stoves was abolished in 1903.

Sixteen years ago, the income of the department was £579,277, with a gross profit of £134,697. The interest totalled £30,305, leaving a net profit of £104,392. A sum of £54,044 was paid into the City Fund for the relief of the rates; the amount charged against revenue in respect of renewals was £24,690; the total value of profits and assets was £1,914,331; and the total amount of liabilities aggregated £985,854, with excess of assets totalling £928,477. Stupendous increases have taken place in the sixteen years which have passed since that time. In 1910, the income of the department was £750,700. The gross profits were £169,244, and the net profits £121,191. The amount charged against revenue in respect of renewal of plant was £55,963; the total value of profits and assets was £3,138,836; the total amount of liabilities was £1,390,092; and the excess of assets was £1,748,744. In sixteen years, the total value of property and assets has increased by £1,331,358; the liabilities have increased by £460,743; and the excess of assets by £870,615. A total income of £10,878,185 has been earned in that period, and net profits made of £1,710,908. A sum of £219,103 has been applied to extensions of works where borrowing powers were not granted; while the vast amount of £851,182 has been, in that time, paid into the City Fund for the relief of rates.

It is interesting to observe that the annual grants in relief of rates have not been uniform. In the present year, for instance, £50,000 was the figure allocated; whereas sixteen years ago it was £54,044. The lowest figure granted in the time was £40,000, in 1897; while the highest was £70,000, in 1904. In the sixteen years under review, meter-rents and stove-hire have been abolished; the quantity of gas supplied to automatic meters has been increased from 25 to 30 cubic feet for 1d.; and a reduced price charged for gas supplied for power and manufacturing purposes. This period also marks the introduction of carburetted water gas and the commencement of the manufacture of sulphate of ammonia and sulphuric acid. The area of sites of works and other properties of the department now aggregate 81 acres 3018 square yards.

A final statement of fact adds interest to the foregoing. Alderman Robert Gibson was first appointed Chairman of the Gas Committee of the Corporation in 1894, and has been annually re-elected ever since. Hence the statement just covers his period of office with the Committee.

ABERDEEN CORPORATION GAS UNDERTAKING.

In the Aberdeen Town Council on Wednesday last—Lord Provost Wilson presiding—Councillor A. Milne, the Convener of the Gas Committee, in presenting the accounts of the Department (a summary of which appeared in the "JOURNAL" last week, p. 670), said that upwards of £445,000 had been spent on the gas-works. Of this sum, nearly £80,000 was written off in 1897, when a new valuation was made, and the remainder had been yearly written-down, until now the whole liabilities of the undertaking were only a little over £151,000. The amount received for gas last year was £92,445, as against £95,101—a decrease of £2656, which was accounted for by a reduction of 1d. per 1000 cubic feet made a year ago to ordinary consumers, and of 4d. per 1000 cubic feet to prepayment meter consumers. These reductions represented a sum of upwards of £4000. The revenue from residuals was £26,041, as against £24,808—an increase of £1233. The total revenue was £121,049, compared with £122,637. Coal cost £53,094, and the material for carburetted water gas £6056, together £59,150, as against £60,407—decrease, £1257. These items, with wages, repairs, &c., made up the cost of manufacture to £79,679, as against £80,977—a decrease of £1298. Distribution of gas, in which was included this year the large sum of £1736, the original value of old wet meters broken up, had cost £4909—an increase of £680, due to the increased number of meters broken up. House services had fallen by £327, occasioned, doubtless, by dulness in the building trade. Rents and feu duties were the same. Rates and taxes had fallen by £788, by reason of a reduced valuation, which was subject to fluctuations, due to the rise or fall in raw material—chiefly coal. The other charges were similar, and did not call for any special comment. The balance on the account was £22,972, which was carried to net revenue, to meet interest, sinking fund, &c. This balance, notwithstanding the reduction in the price of gas, was an increase of £219 on the previous year. The amount required for annuities was £4063; for interest, £4051; for sinking fund, £10,909; for insurance fund, £300; and for the renewal fund, £3000. These sums were much on a par with last year. The net balance was £648, which, added to the balance brought from previous years, gave a sum of £4047 to be carried forward. The contingent fund, for the redemption of gas annuities, now stands at £75,498; the sinking fund for the repayment of loans, at £128,326; the reserve and fire insurance fund, at £37,187; and the renewal fund, at £8555. The increase in the make of gas over the previous year was 18½ million cubic feet, or 2·38 per cent. He wished particularly to refer to the great increase which there had been in the number of gas-stoves hired, and of prepayment meters in use. Taking the accounts as a whole, the Council had reason to be pleased with the result of the year's working. He had received an interesting comparative statement from Mr. S. Milne, the Engineer, showing the progress of the department from 1900 onwards. During the year ending July 31, 1910, they made 568 million cubic feet of gas; and in the past year the make was 795 million cubic feet. In 1900, the number of ordinary consumers was 30,001, compared with 32,613 now; while the number of prepayment meter consumers then was 2444, as against 9394 now. There were 245 gas-engines in use ten years ago, with a total horse-power of 1208, and now they had 329 engines, with a horse-power of 4363. The price of gas in 1900 to ordinary consumers was 3s., and to prepayment meter consumers 4s. 2d., per 1000 cubic feet. The present prices were 2s. 6d. and 2s. 10½d. respectively. In addition, about 600 gas appliances, including grills, gas irons, fires, boiling burners, and lustre stoves were sold during the year. He moved the adoption of the accounts and estimates.

Bailie Todd seconded the motion, and it was unanimously carried.

The prices of gas were continued unaltered.

GAS CHARGES AT BOLTON.

No Further Concession to Prepayment Meter Users.

There was another discussion at last Wednesday's meeting of the Bolton Town Council, on the question of the charge made for gas supplied to consumers by prepayment meter. It will be remembered that the Gas Committee had reconsidered the matter at the request of the Council, and re-affirmed their previous decision that the charge to prepayment users be 1d. per 27 cubic feet, instead of 25 cubic feet, rejecting a proposal made by the Labour members of the Council that the quantity supplied for the penny be 30 feet.

Mr. FRANCE, one of the labour members, expressed the opinion that the Gas Committee were ill-advised in being obstinate. The claim he made was put forward on behalf of the poorer section of the community, and he argued that at 30 cubic feet for 1d. the Gas Committee would have ample margin on the extra cost involved in meters, collection, &c. This was proved by the fact that at Oldham 33 feet were given.

Alderman MILES, a Past Chairman of the Gas Committee, submitted that Mr. France had made a mistake in quoting only one Corporation in support of his contention, and that a town where the prepayment system had been in operation only a short time. He thought the Gas Committee had made out a fair case, and shown that they were dealing reasonably with prepayment users.

Mr. POTTS pointed out that in St. Helens 35 cubic feet were supplied for 1d., in Widnes 50 cubic feet, and in Bury 33 cubic feet. He said that in other towns there was not the same difference between the charges to ordinary consumers and prepayment users as was the case at Bolton. Taking twenty towns, the average difference was about 5½d., showing Bolton had the advantage over those towns of 3½d.

Mr. HEYWOOD, as a member of the Gas Committee, assured the Council that they were most anxious to do what was fair and just to users under the two systems.

The minutes of the Gas Committee were confirmed; but Mr. FRANCE said he hoped at a later date to renew the attack upon this question.

BLACKPOOL GAS UNDERTAKING.

The Blackpool Gas-Works, which are owned by the Corporation, were started in 1850; and the present Manager (Mr. John Chew) took control in 1862. The undertaking has grown to a very big concern. The total outlay to March, 1909, was £210,900; and the reserve and sinking funds in hand amount to £80,000. The price of gas is low—2s. 2d. per 1000 cubic feet for ordinary meters, 2s. 10d. for slot meters, 1s. 10d. for power. Taking a review of the relative amount of sales of gas and electricity from what is known as the "electrical year," 1893, we find that, both departments starting level, rapid increases were made in each till 1911. From then till 1906, both made little headway; but afterwards further progress was recorded. In 1908, the Electrical Department had a set-back, but the gas-works leaped forward. The Gas Department increased the number of consumers from 5700 in 1893, to 14,800 for the last financial year. Last year the gas undertaking handed over to the rates £9557, and the electricity works £3266, which shows the popularity of the old illuminant. The income in the last financial year from gas sales, residuals, &c., was £85,889, and the expenditure £62,990—leaving an available balance of £22,898, against £22,159 the previous year. Gas manufacture cost £49,200, and distribution £2553. The total quantity made was 555,145,000 cubic feet, an increase of 4·04 per cent. The amount consumed by private consumers was 531,975,200 cubic feet, an increase of 3·81 per cent. There are 98 miles of mains, 2340 street-lamps, and 14,816 consumers. The total length of pipes used for new mains last year was 3¼ miles.

The Gosport (Hants) Gas Company have extended their mains to Lee-on-the-Solent; but a difficulty has arisen in the preparation for lighting the place owing to the Rural Authority having declared that the two approaching roads have not been taken over by them. The former arrangements for lighting by acetylene gas have, however, been dropped.

COLONIAL GAS UNDERTAKINGS.

Reports of the working of the following Colonial gas undertakings for the half year to June 30 have recently come to hand (in addition to that of the Australian Gaslight Company, already noticed in our pages).

The revenue of the Brisbane Gas Company from the sale of gas, &c., during the six months was £28,416; and there was a balance brought forward of £7028, making a total of £35,444. The expenditure on gas manufacture, &c., was £14,963; and £3291 was placed to the reserve fund. The net amount to the credit of the profit and loss account was thus £17,190, out of which the Directors recommended a dividend of 6 per cent., which, with income-tax, would absorb £10,080, and leave a sum of £7110 to be carried forward. During the half year, extensions of mains were made in several localities; and additional settings of regenerator furnaces are in course of erection.

The Maryborough (Queensland) Gas and Coke Company, Limited, brought into the accounts for the past six months a balance of £263. Sales of gas, fittings, &c., during the half year produced £2502, residual products £238, and interest £8. Thus there was a total of £3011, from which had to be deducted the expenditure of £2021, which left a disposable balance of £990 to the credit of the profit and loss account. The Directors recommended the payment of a dividend for the half year at the rate of 6 per cent. per annum, tax free, which would absorb £773, and leave £217 to be carried forward. The erection of three generator settings of retorts was completed during the half year.

The general strike of coal miners, which was entered upon at the beginning of November last year, continued until about the middle of March; and owing to the high prices paid for coal during the strike period, the North Shore (Sydney) Gas Company suffered very heavy pecuniary loss. In consequence of this loss, £10,525 has been transferred from the reserve fund to provide for depreciation, and to enable the usual rate of dividend for the half year to June 30 to be maintained. The loss on the sale of gas, &c. (after allowing for depreciation) was £4225; and the balance (£6300) of the sum taken from the reserve fund is absorbed by the dividend of 4 per cent., free of income-tax, for the six months.

GAS AND ELECTRICITY AT CHARTERS TOWERS.

An interesting account reaches us of a fight to a finish between the Gas Company and an Electric Supply Company at Charters Towers, Queensland.

In December, 1907, Mr. Charles A. Watson was appointed Engineer and Manager of the Charters Towers Gas Company, Limited; and he immediately started an active campaign to popularize gas—with results which have been most gratifying both to his Company and himself. A free maintenance system was inaugurated (materials being charged for at wholesale cost price); and "Graetzin" inverted burners, and gas "Arc" lamps were extensively put out. A large number of the latter (of an old type) which were out on rental, were offered for sale to the consumers who had them in use at reduced prices; and where this offer was taken advantage of, it, of course, at once strengthened the position of the Company against the intrusion of electricity. Then the price of gas was reduced from 13s. 4d. to 12s. 6d. per 1000 cubic feet (less discount) for lighting; and this step Mr. Watson followed up by the issue broadcast of comparison cards showing by means of simple calculations the indisputable advantages in the matter of cost which incandescent gas lighting possesses over electricity. Another successful step was to approach, by means of a circular letter, those electricity consumers whose contract for current was about to expire—pointing out the economy of gas lighting, and offering to furnish estimates or to put in a Graetzin inverted light on trial.

The upshot of the campaign was that the Electric Supply Company found themselves in financial difficulties; and an effort to reconstruct the Company and secure fresh capital not meeting with a very sympathetic reception, the Gas Company were offered the undertaking for the amount of its debts. This offer, after due consideration, was accepted—thus getting rid of a very irritating opposition. During the fight, the Electricity Company carried on free wiring, distributed lamps broadcast without charge, and came out with a flat-rate down to about 4d. per unit. These tactics, as has been seen, were unsuccessful with the Company; and electricity is now offered by the Gas Company only on strict business terms. The announcement was made that they intended to supply current at the price of 1s. 3d. per unit allowed under the Order (which has still nearly thirty years to run).

Mr. Watson has been appointed Engineer and Manager of the electricity station, in addition to the gas-works; and it may be hoped that, with the increased price for current, success will attend the Company's new venture.

NATURAL GAS: FROM SUSSEX TO CHINA.

In last week's issue (p. 671) there was reproduced a paragraph from the "Daily Mail" dealing with a circular that had been issued to the shareholders in the Heathfield natural gas enterprise, in which it was stated that negotiations were proceeding between the Asiatic Protection Society of Great Britain and China and the South of England Natural Gas Company, for the purpose of introducing the various governors and officials of the districts of China to the Natural Gas Company, and inducing them to accept this Company as the principal exploration company for the purpose of exploring and developing the natural gas resources in China. It was stated that several foreign banks had been approached in the matter of taking up the shares; and the Society thought it only fair that the shareholders in the Natural Gas Company should have the first refusal of the balance. Our contemporary subsequently published in its "Chat on Change" the following further remarks: "The solicitude of the Asiatic Protection Society, of No. 14, Shepherd's Bush Green, for the shareholders of the South of England Natural Gas Company, with its efforts at Heathfield, Sussex, is even deeper than we had gauged. In spite of the fact that 'several foreign banks' had been approached to take up shares, the shareholders were offered the refusal of the balance for ten days from Aug. 20. This period has, of course, expired; but the quality of mercy is not strained, and the natural gas shareholders, in a further communication from the Asiatic Protection Society, are given until Sept. 15 to snatch the shares from the greedy foreigner. After that date, the Society point out, it will be impossible for the shareholders to secure more shares. Such solicitude should be countered by generosity; and in our opinion the shareholders should allow the Asiatic Protection Society to subscribe for the shares themselves. The Society are doubtless all the more eager to do so, because of the advice of two of their officials. One of these, Captain Howard, 'late Commander in his Imperial Highness the Emperor's Regiment,' and the other, 'an expert of natural gas and a pupil of the most noted explorer, the late Mr. H. Stanley,' are stated to be of opinion that, 'as and when the Company have obtained sufficient capital to sink their 2000 feet shaft, they will be one of the most wealthy and prosperous concerns going.' This is why the Asiatic Protection Society 'have taken up' the Natural Gas Company, and will send out the late Commander for the purpose of 'closing some very important contracts with the various Chinese officials.' Perhaps the Chinese officials would like a few of the shares that seem to be going begging." Yesterday the matter was carried further by the following interesting announcement: "We are informed by the Asiatic Protection Society that they have severed all connection with the South of England Natural Gas Company, in consequence of inquiries they have made as a result of the comments which appeared here a week ago. The officials of the Society are anxious that the members should understand this. In the letter they send us, the Society frankly admit they were misled in the matter by inaccurate statements the nature of which they have now discovered. There seems not the slightest doubt that they have acted in perfect good faith throughout the whole matter—indeed, this seems obvious from the alacrity with which they have withdrawn from the curious position to which we drew attention. In any case, there is now an end of the matter; and the shareholders of the South of England Natural Gas Company who received the Society's strange circulars descanting on their prospects, must regard those circulars as having been withdrawn."

LEEDS WATER CHARGES.

Increase Sanctioned.

At the Monthly Meeting of the Leeds City Council last Wednesday, the principal business was the consideration of a proposed increase in the water-rates of about 30 per cent. Before the resolution in the matter was moved, a deputation representing the Leeds and District Property Owners' Association attended to protest against certain features of the proposed new scale. The spokesman said that, in the case of a 5s. a week house, which was the class of property represented to the greatest extent by the deputation, the water charge amounted now to 12s. 8d., including the closet. With the new charges in operation, the same class of house would have to pay 16s. 4½d.—an increase of 30 per cent., or 1d. per week per house. This increase would fall upon the owner of the property, as under present circumstances it was impossible to increase the rent to the tenant.

Mr. WILLEY, in proposing the confirmation of the new scale, said the additional charges were an absolute necessity to meet the financial requirements of the Water Department. At the present time, the Corporation had invested in water-works about £3,444,000; and though the undertaking had always been a profit-earning concern, it had, comparatively speaking, earned only a small profit. During the last ten or fifteen years, the revenue had never exceeded £162,000; the lowest mark being about £135,000 ten years ago. As a commercial concern, the undertaking could hardly be called highly successful from the profit-earning point of view, though he admitted that the first object should be to provide an unfailing supply of wholesome water, and that income should be a secondary consideration. The profits had ranged between £19,000 and £14,000 a year; and during the last ten years about £152,000 had been allocated by the Water Committee for the relief of the rates. Now the moment had arrived when nothing more could possibly be provided for the relief of the rates, and there was no prospect of anything being so provided for twelve or fourteen years to come. The need for new charges arose in this way: In 1901, when there was a prospect of a water famine, the City Council obtained powers to make reservoirs at Leighton and Colsterdale, extra reservoirs in the Laver Valley, to lay a pipe-track, and to make new filter-beds. The Council also secured authority to borrow £2,200,000 for these works. They embarked upon the construction of the Kettlesing tunnel, the laying of the pipe-line, and the making of the Leighton reservoir. On this work, the Council had expended £888,000. In addition to this, under their Act of Parliament, they had power to borrow money to pay interest on money spent on unproductive works; and under this head they had borrowed £106,000. Therefore what they had to pay off under the Act of Parliament was about £1,000,000. In addition, they had had a very careful estimate made as to what would have to be spent to complete the works he had referred to; and according to this, £500,000 would have to be found before 1921. The Committee were tied hand and foot as to the repayments they would have to make. In 1912, they would have to provide an extra sum of £32,396 out of revenue; in 1913, £49,000; in 1914, £52,000; in 1915, £58,000; and the sum would gradually rise to £86,575 in 1921, which would represent the increased amount to be found out of revenue as compared with the present year. The position was simple and arbitrary. The capital had been spent; and they had, as a matter of course, to find the money to repay it. It must be repaid out of revenue; and the only possible way of repaying it was to increase the price of water. It would be impossible for any Committee to frame a new scale which would satisfy everybody concerned. The Committee knew that they would be treading on some people's toes; but the increased charges were,

comparatively speaking, on a fair and equitable basis, and would not penalize any class of the community or treat one unfairly as against another. It was quite true that in 1911 there would be yielded an increased revenue of £53,000, when only £32,000 would be needed. This would go on for a year or two; but for nine years the new charges would realize some £20,000 or £30,000 less than was required. The money was to be spread equally over the whole period. The proposed increases were intricate; and without going very deeply into them, he would say that, with one or two exceptions, the water charges in Leeds compared more than favourably with the charges made in the other large cities of the country. Referring to the case of lock-up shops, warehouses, banks, offices, and buildings of this character, he said that in 1860 a resolution was passed putting these people upon a special basis. The maximum charge for any one of these buildings, regardless of the amount of water consumed, was £1; and the Committee discovered that for years certain places in the city, with thirty or forty methods of consuming water, had only paid £1 a year on premises of large rateable value. In one case, this £1 a year was paid in respect of a building with a rateable value of £2000. In this instance, the tenant would in future pay £28 10s. The revision of the charges for this class of property would perhaps involve hardship in some cases; but it would bring in much more adequate returns from property now paying only £1, and in which perhaps thirty or forty employees worked, and a great deal of water was consumed. Water supplied by meter to manufacturers would be charged at 9d. to 9½d. per 1000 gallons instead of 6d., which was the cost price of water. Though they were anxious to safeguard the manufacturing interests of the city, it would not be right that any consumer should be getting water at cost price when others were paying a figure that yielded a profit. He would like to point out that, taking into account the capital charges which had to be met, the cost price of water would now be 9d. per 1000 gallons. As to the charges for meters, these compared favourably with those imposed in other towns. The working expenses of the Water Department had gone down by no less than £7000 a year; and this fact would contradict any suggestion that the increased charges were necessitated by extravagance in administration. The consumption of water, too, had dropped to the extent of 2½ gallons per head per day—a saving of 1,250,000 gallons per day on the present population. This was probably attributable to the vigilance with which the officials had discovered and prevented leakages. In regard to the excess of income which would accrue from the new charges for a year or two, he would do everything in his power to see that, by all legal means, this money should be ear-marked for the repayment of indebtedness.

At the conclusion of a lengthy discussion, the resolution was carried by 26 votes to 8.

Gosport Water Supply.—The report presented by the Directors of the Gosport Water Company to the shareholders at their half-yearly meeting last Wednesday, showed that the revenue for the six months ended June 30 had been £5264, and that there was left £3083 for transfer to the profit and loss account. The water-rentals amounted to £5207. The available balance was £5526. Since the last meeting, 39 new services had been connected with the Company's mains.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The death falls to be recorded this week of Mr. T. Whimster, late Gas Engineer and Manager at Perth. Mr. Whimster was over ninety years of age. He has outlived all his compeers. Blessed with good health, he was able to fill the position of Gas Manager at Perth for the long period of forty-four years; and he has lived in retirement for the further long period of fifteen years. He has, in fact, been so long in retirement, that he was not personally known to the younger generation of gas managers. To those whose memories extend further back, Mr. Whimster's figure stands forth as that of a sturdy upholder of the best precepts in public as well as in private life, and a faithful adherent to the right, according to his knowledge. He was a steady supporter of all that led to advance in gas manufacture, and gave his best service to the Companies, and latterly to the Corporation, who employed him, and by whom, in turn, he was greatly respected and honoured.

The Glasgow Gas Committee reported to the Town Council on Thursday the proceedings which took place in the procuring of the Gas Consolidation Act. The benefits derived from the measure are stated as: (1) The consolidation of the provisions of about twenty Acts of Parliament into one Act; (2) definite limits of supply; (3) the division of the limits of supply into (*a*) a city supply district, and (*b*) a supplementary supply district, being all territory within the limits of supply outside the city supply district; (4) the right to charge a higher rate for gas supplied in the supplementary supply district than is charged in the city supply district; (5) permission to differentiate between charges for gas supplied for lighting purposes and gas supplied for manufacturing and industrial purposes; (6) the making of contracts with large consumers, and the granting of rebates and discounts to these consumers; (7) power to grant rebates for prompt payment; (8) a lower rate for gas supplied to public lamps than is charged to consumers generally; (9) an equation of the varied sinking funds charged under the old Acts to a uniform sinking fund of 2½ per cent. on all moneys borrowed for gas purposes and on the capitalized value of the gas annuities; (10) power to charge for the hire of meters which the Corporation formerly had to supply free of charge; (11) permission to establish a reserve fund at a rate not exceeding ½ per cent. on the amount of capital outstanding until the fund is equal to 10 per cent. of the outstanding capital; and (12) the reduction of the power of gas from 16 to 14 candles.

In the Peterhead Town Council on Monday, the Gas Manager—Mr. W. Ritchie—reported that during the past year 5074 tons of coal were carbonized, which yielded 52,091,000 cubic feet of gas—equal to a make of 10,266 cubic feet per ton. In the previous year, they carbonized 4805 tons of coal, and obtained 49,427,700 cubic feet of gas—equal to 10,296 cubic feet per ton. The increased make was 2,618,300 cubic feet, which was equal to 5·3 per cent. over the previous year. During the year, there were added 21 ordinary and 264 prepayment meter consumers; making the number of ordinary meter consumers 1612, and of prepayment meter consumers 1505—a total of 3117. The revenue from gas was £7083—an increase of £531. Residual products realized, after deducting expenses, £1581, or £149 less than in the previous year; the

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 706.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,474,000	Stk.	Apl. 1	5	Alliance & Dublin Ord.	81–84	..	5 19 1
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	97–99	..	4 0 10
200,000	5	May 12	7	Bombay, Ltd.	⅞–1	..	5 7 7
40,000	5	,,	7	Do. New, £4 paid	4⅛–5⅛	..	5 9 3
50,000	10	Aug. 31	15	Bourne-mouth Gas and Water	B 7 p.c.	..	4 4 10
311,810	10	,,	7		10 p.c.	..	16–16⅜*	..	4 4 10
75,000	10	,,	6		Pref. 6 p.c.	..	14⅜–15⅛*	..	3 18 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	246–249	..	5 0 5
330,000	,,	,,	9½	Do. New	184–186	..	5 2 2
50,000	,,	,,	5	Do. 5 p.c. Pref.	—	..	—
206,250	,,	June 10	4	Do. 4 p.c. Deb.	99–101	..	3 19 3
220,000	Stk.	Aug. 31	11	Brighton & Hove Orig.	214–217*	+5	5 1 5
246,320	,,	,,	8	Do. A Ord. Stk.	154–157*	+4	5 1 11
460,000	20	Apl. 1	10⅝	British	45–46	+½	4 12 4
109,000	Stk.	Aug. 12	6	Bromley, A 5 p.c.	117–119	..	5 0 10
165,700	,,	,,	4½	Do. B 3½ p.c.	88–90	..	5 0 0
82,278	,,	,,	5½	Do. C 5 p.c.	106–108	..	5 1 10
55,000	,,	June 29	3½	Do. 3½ p.c. Deb.	85–87	..	4 0 6
250,000	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	97–99	..	4 0 10
100,000	10	—	—	Cape Town & Dis., Ltd.	3–4	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	5⅛–6⅛	..	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	49–50	..	6 0 0
100,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	88–90	..	5 0 0
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	103½–111½	+½	4 9 8
1,513,280	Stk.	,,	5 5/16	Commercial 4 p.c. Stk.	105–108	+½	4 16 3
560,000	,,	,,	5	Do. 3½ p.c. do.	101–103	..	4 17 1
475,000	,,	June 29	3	Do. 3 p.c. Deb. Stk.	80–82	..	3 13 2
800 000	Stk.	June 10	5	Continental Union, Ltd.	98–100	+3	5 0 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	137–139	+2	5 0 9
491,470	Stk.	—	5½	Derby Con. Stk.	122–124	..	4 8 9
55,000	,,	—	4	Do. Deb. Stk.	104–105	..	3 16 2
148,995	,,	Apl. 1	5	East Hull 5 p.c. Ord.	96–98	..	5 2 0
486,992	10	July 14	12	European, Ltd.	23¼–24	..	5 0 0
354,062	10	,,	12	Do. £7 10s. paid.	17⅞–18½	..	4 18 8
16,179,415	Stk.	Aug. 12	4⅝	Gas light and Coke	4 p.c. Ord.	..	105–107	+½	4 7 2
2,600,000	,,	,,	3½		3½ p.c. max.	..	87–89	..	3 18 8
4,002,235	,,	,,	4		4 p.c. Con. Pref.	..	102–104	..	3 16 11
4,531,703	,,	June 29	3		3 p.c. Con. Deb.	..	83–52	..	3 13 2
258,740	Stk.	Mar. 16	5	Hastings & St. L. 3½ p.c.		..	94–56	..	5 4 2
82,500	,,	,,	6½	Do. do. 5 p.c.		..	117–119	..	5 9 3
70,000	10	Apl. 29	11	Hongkong & China, Ltd.		..	17–17⅛	..	6 5 9
131,070	Stk.	Mar. 16	7½†	Ilford A and C		..	147–150	..	4 18 4
65,783	,,	,,	5½†	Do. B		..	114–116	..	5 1 3
65,500	,,	June 29	4	Do. 4 p.c. Deb.		..	98–100	..	4 0 0
4,940,000	Stk.	May 12	9†	Imperial Continental		186–188	+2	4 15 9
1,235,000	Stk.	Aug 12	3½	Do. 3½ p.c. Deb. Red.		52–94	..	3 14 5
200,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c.		119–121*	..	4 19 2
561,000	Stk.	,,	10	Liverpool United A.		215–217*	+1	4 12 2
718,100	,,	,,	7	Do. B		161⅛–163½*	..	4 5 8
306,083	,,	June 29	4	Do. Deb. Stk.		104–106	..	3 15 6
75,000	5	June 29	6	Malta & Mediterranean		4⅛–4⅜	..	6 4 8
560,000	100	Apl. 1	5	Met. of Melbourne	5 p.c. Deb.	100–102	..	4 18 0
250,000	100	,,	4½		4½ p.c. Deb.	101–103	+1	4 7 5
541,920	20	May 27	3½	Monte Video, Ltd.		12½–13	..	5 7 8
1,775,892	Stk.	July 28	4½	Newc'tle & G'tesh'd Con		102–103	+½	4 5 0
529,435	Stk.	June 29	3½	Do. 3½ p.c. Deb.		90–91	..	3 16 11
55,940	10	Aug. 31	7	North Middlesex 7 p.c.		13–13½*	..	5 3 8
300,000	Stk.	Apl. 29	8	Oriental, Ltd.		138–140	..	5 14 4
60,000	5	Apl. 1	8	Ottoman, Ltd.		6⅛–6⅜	..	6 3 1
31,800	53	Aug. 31	13	Portsea Island A.		131–133*	..	5 3 0
60,000	50	,,	13	Do. B.		124–126*	..	5 3 2
100,000	50	,,	12	Do. C.		117–119*	..	5 0 10
114,800	50	,,	10	Do. D and E.		99–101*	..	4 19 0
398,490	5	Apl. 29	7	Primitiva Ord.		7⅛–7⅜	..	4 13 4
796,980	5	June 29	5	Do. 5 p.c. Pref.		5⅛–5⅜	..	4 13 0
488,902	100	June 1	4	Do. 4 p.c. Deb.		97–99	..	4 0 10
312,650	Stk.	June 29	4	River Plate 4 p.c. Deb.		97–99	..	4 0 10
250,000	10	Apl. 1	9	San Paulo, Ltd.		15⅝–16⅞	..	5 10 9
62,500	10	,,	6	Do. 6 p.c. Pref.		11½–12½	..	4 18 0
125,000	50	July 1	5	Do. 5 p.c. Deb.		51–52	..	4 16 2
135,000	Stk.	Aug. 31	10	Sheffield A		229–231*	..	4 6 7
209,984	,,	,,	10	Do. B		229–231*	..	4 6 7
523,500	,,	,,	10	Do. C		229–231*	..	4 6 7
70,000	10	May 27	7	South African		11–11⅛	..	6 1 9
6,429,895	Stk.	Aug. 12	5/9/4	South Met., 4 p.c. Ord.		121–123	+1	4 8 10
1,895,445	,,	July 14	3	Do. 3 p.c. Deb.		79–81	..	3 14 1
209,820	Stk.	Aug. 31	8	South Shields Con. Stk.		153–154*	..	5 3 11
605,000	Stk.	Aug. 12	5⅜	S'th Suburb'n Ord. 5 p.c.		120–122	..	4 12 9
60,000	,,	,,	5	Do. 5 p.c. Pref.		120–122	..	4 2 0
117,058	,,	July 14	5	Do. 5 p.c. Deb. Stk.		121–123	..	4 1 4
502,310	Stk.	May 12	5	Southampton Ord.		110– 1	..	4 9 3
120,000	Stk.	Aug. 12	7	Tottenham and	A 5 p.c.	140–142	+4	4 18 7
483,940	,,	,,	5½		B 3½ p.c.	111–113	..	4 17 4
149,470	,,	June 29	4	Edmonton	4 p.c. Deb.	57–59	..	4 0 10
182,380	10	June 10	8	Tuscan, Ltd.		9–9⅜	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.		97–99	..	5 1 0
236,476	Stk.	Aug. 31	5	Tynemouth, 5 p c max.		111–113*	..	4 8 6
255,636	Stk.	Aug. 31	6½	Wands-worth	B 3½ p.c.	136–138*	..	4 17 10
85,766	,,	June 29	3		3p.c. Deb. Stk.	73–75	..	4 0 0

Prices marked * are "Ex div." † Next dividend will be at this rate.

reduction being due principally to lower market prices. Purification cost £110 more, which could only have been looked for, owing to the condition of the purifying plant and the extra quantity of gas to be purified. Wages paid to stokers was £49 more; the increase being due principally to the increased quantity of coal carbonized. Maintenance of works and plant cost £558—a decrease of £119. Renewals and repairs to meters cost £205, or £7 less. The cost of maintaining main and service pipes was £147, or £10 less. Rates, taxes, and insurances amounted to £691—an increase of £35. The total revenue was £8843, and the expenditure £8792; leaving a balance of £51. The improvements and extensions which were at present being carried on at the works, consisting of the erection of a new purifier house and purifiers, and the reconstruction of the property in Longate, were nearing completion, and would prove, in due course, to be a great benefit. The Gas Committee recommended that the price of gas be increased from 3s. to 3s. 2d. per 1000 cubic feet. Mr. Clubb could not see that it was necessary to increase the price of the gas. Bailie Birnie, the Convener of the Gas Committee, explained that the £51 which they had carried to net revenue account was not sufficient to provide for a reserve fund, and that it was necessary that they should provide a sinking fund for the repayment of money borrowed. When the price of gas was reduced from 3s. 3d. to 3s., it was a debatable question whether they should reduce it by 3d. or by 1d. only; but they then thought they could manage without the other 2d. They now found that in nearly every gas-works in the country they had had to advance the price of gas from the day that in Peterhead they lowered theirs. They had tried to keep the price down for the last two years, but they now found it necessary to raise it. Provost Leach said they had to provide £600 for a sinking fund, and it would require 2d. per 1000 cubic feet to do this. Mr. Clubb said he was satisfied. The increase in the price was then agreed to, to take effect as from May 15 last.

Presiding at the annual meeting of the St. Andrews Gas Company yesterday, ex-Bailie Aikman said that the balance-sheet submitted was the best ever produced in the history of the Company. This reflected great credit on their Manager and Secretary, Mr. Robert Hall. The report of the Directors was approved. A special meeting of the shareholders was then held, at which it was resolved that the co-partnership be dissolved, and that a limited liability Company be formed, with a capital of £16,960, divided into 1696 shares of £10 each.

In the Banff Town Council on Monday, the subject of lighting the street lamps on Sunday evenings was considered. The Directors of the Gas Company intimated that the extra lighting asked for would cost £4 per season, but that they would do it for £3. After discussion, it was agreed to accept the Company's offer; and the Convener of the Committee on Lighting was authorized to arrange as to the hours of lighting.

The Gas Committee of the Greenock Corporation have agreed to recommend a reduction of 10 per cent. upon the charges for gas to consumers whose accounts amount to upwards of £100 a year.

In the small town of Insch, in Aberdeenshire, the streets are lighted partly by gas-lamps, partly by paraffin lamps. The gas-lamps are in the centre of the town, and the outskirts are lighted by paraffin lamps. Residents in the outskirts consider that as they pay the same as the others, they should have as good a light. So a petition, signed by 38 inhabitants, was presented to the Committee in charge of the lighting, asking that the whole district be lighted by gas. To settle what should be done, a public meeting of the inhabitants was held on Wednesday. It was proposed that the District Committee of the County Council be requested to take over the gas-works, and to light the whole district by means of gas. Against this it was proposed that the lighting system remain as at present till such time as the place should be made into a police burgh. The latter motion was carried by thirteen votes to seven.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 10.

Sulphate of Ammonia.

During the week there has been a resumption of the good demand, and a dearer market has once more to be recorded. The purchasing has still been largely for the covering of old contracts; but there has also been a fair amount of new business, and values at the close have reached £12 7s. 6d. to £12 8s. 9d. per ton f.o.b. Hull, £12 8s. 9d. to £12 10s. per ton f.o.b. Liverpool, and £12 10s. to £12 11s. 3d. per ton f.o.b. Leith. The forward position seems to be rather neglected; buyers evidently confining their attention to near delivery. There has been some inquiry from consumers abroad, but at prices which no British manufacturer will entertain.

Nitrate of Soda.

There is no new feature to comment upon in the market for this article; the quotations on spot remaining very steady at 9s. 4½d. per cwt. for 95 per cent. quality and 9s. 7½d. for refined.

LONDON, *Sept.* 12.

Tar Products.

The markets for tar products have been steady during the past week. Pitch has been firm at the existing prices, though the Continent are still disinclined to pay the figures asked by makers on this side. Benzol, 90 per cent., is rather steadier, although there is no improvement in price. The Continent appear anxious to purchase on a basis of about 4¾d. to 5d. naked, for delivery all over next year. Fifty-ninety per cent. benzol is steady. There is little demand for toluol. Solvent naphtha is quiet, and business has been done at rather low figures for forward delivery. Carbolic acid is steady without any change in price. Naphthalene is firm; and creosote salts are in good demand. Creosote is quiet, and there is little business doing. Tar maintains its price.

The average values during the week were: Tar, 19s. to 23s., *ex* works. Pitch, London, 38s. to 38s. 6d.; east coast, 38s. to 38s. 6d.; west coast, 36s. 6d. to 37s. 6d. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 7d. to 7¼d.; North, 6¾d. to 7d.; 50-90 per cent., casks

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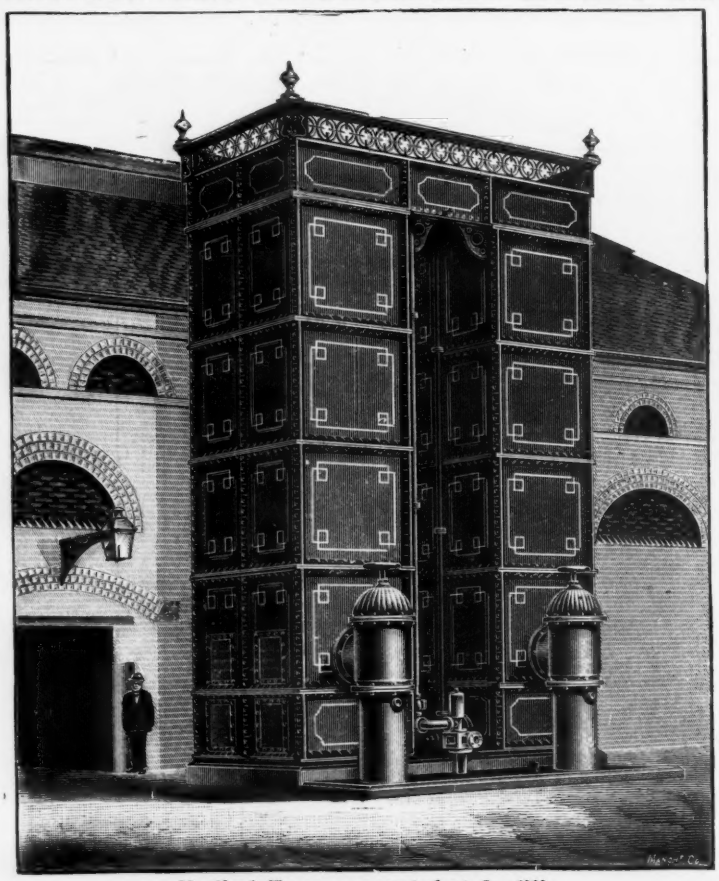

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included, London, 7½d. to 7⅝d.; North, 7¼d. Toluol, casks included, London and North, 9d. to 9½d. Crude naphtha, in bulk, London, 3⅝d. to 4d.; North, 3⅛d. to 3¼d.; solvent naphtha, casks included, London, 1s. to 1s. 1d.; North, 11d. to 1s.; heavy naphtha, London, 11d. to 11⅛d.; North, 10⅝d. to 11d. Creosote, in bulk, London, 2⅝d. to 2¾d.; North, 2d. to 2⅛d. Heavy oils, in bulk, 2⅝d. to 2⅞d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 0⅛d.; west coast, 1s. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has been very firm indeed throughout the past week, and prices have advanced considerably. The Gas Companies quote £11 15s. to £11 17s. 6d.; while outside makes are £11 8s. 9d. to £11 10s. In Hull, £12 10s. has been paid for the best makes. In Leith, this price has been refused; while similar figures have been paid in Liverpool and also declined. In Middlesbrough, £12 10s. to £12 12s. 6d. is asked.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a fair demand in the coal trade for this season; but there are ample supplies of all classes of coal. In the steam coal trade, there is a little ease in the prices generally. Best Northumbrian steams are from 9s. 9d. to 9s. 10½d. per ton f.o.b., second-class steams are about 8s. 9d., and steam smalls are from 5s. 6d. to 6s. 9d. The production is well maintained; and the shipments are now beginning to make up the loss in the early months of the year when there were stoppages at the collieries. In the gas coal trade, the local demand is growing steadily. For Durham gas coals, the price varies from 9s. to 9s. 7½d. per ton f.o.b. for the usual classes, according to quality. There are forward sales of gas coals in negotiation, and there have been some sales for Genoa district, at about 16s. per ton, delivered, though sales at slightly less are spoken of as probable. Some contracts for the supplies of small companies are also probably early for gas coals. As to coke, the market is quiet; and the increased supply of gas coke influences the price, which is about 14s. 6d. to 15s. 3d. per ton f.o.b. for good gas coke.

Scotch Coal Trade.

Trade continues sluggish; the foreign trade being the least satisfactory. Prices, however, remain unchanged. The quotations now are: Ell, 8s. 9d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 9s. 6d. to 9s. 9d.; and steam, 8s. 9d. to 9s. The shipments for the week amounted to 324,356 tons—a decrease of 8801 tons upon the previous week, and of 11,844 tons upon the corresponding week of last year. For the year to date, the total shipments have been 10,953,825 tons—an increase of 850,588 tons upon the corresponding period.

"Coalexld."

The Paris Agent of Coalexld, Limited, reported to them that, in a conversation he had had with a doctor of science in that country respecting the effect produced by the chemicals in the process of manufacture of coalexld, the Doctor made the following statement: "The oxygen gas created by coalexld chemicals changes the nature of the sulphur compound by transforming the sulphur into sulphuric acid, which becomes soluble in water." This information was submitted to the Analytical Chemist of Coalexld; and he reported as follows: "As regards your Paris Agent's remarks, the gas which your chemicals create is oxygen; and this, having a specific gravity of 11·05, is, of course, far heavier than coal gas, whose specific gravity averages about 0·4. The sulphur compounds are oxydized, and the sulphuric acid gas which is formed dissolves in water." The Company have taken a stand at the Smoke Abatement Exhibition in Glasgow; while the following recommendations have been made by a Special Committee of the Glasgow Corporation appointed to inquire into any process of gas making which would produce a form of coal residue available for use in ordinary domestic grates: (1) That the Engineer be instructed to continue his experiments with steam-quenched coke and coalexld; and (2) that the Engineer be authorized to supply coalexld for use in ordinary domestic grates.

Increased Consumption of Gas at Heywood.—At the monthly meeting of the Heywood Town Council last Thursday, Mr. W. Whatmough, the Gas Manager, presented his report for the quarter ended June 30. This showed that the consumption of gas for the three months had been 20,653,840 cubic feet, as against 19,988,980 cubic feet in the corresponding quarter of last year; while the receipts were £2793, as compared with £2706. It was explained that the consumption of gas had been greater than the figures in the report indicated.

The Proposed Extensions at Belfast.—A special meeting of the Belfast City Council was called for yesterday morning, in pursuance of a requisition, to take into consideration the advisability of rescinding the resolution adopted some months ago in favour of the acquisition of the Twin Island site for the proposed auxiliary gas-works, and of taking such further action as may be determined upon. The requisition was worded as follows: "We, the undersigned, request that a special meeting of the Council of the County Borough of Belfast be called to rescind the following resolution passed by the Council on the 16th of March, 1910: 'That the minutes of the proceedings of the Gas Committee of the 17th of September, 1909, relating to the proposed auxiliary gas-works (omitting the reference to the Ormeau Park site), be, and they are hereby, received; that the expert's report called for on the 4th of October, 1909, having now been presented, the site known as the Twin Island site, appearing to be the most advantageous offered, be selected for the proposed auxiliary gas-works, and that the Gas and Law Committees be authorized to take the necessary steps to acquire it;' and to take such further action as the Council may determine." No fewer than 34 members of the Corporation signed the requisition.

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LEST YE FORGET.

Price of Gas at Oldham.

At the monthly meeting of the Oldham Town Council, Alderman Thompson, the Chairman of the Gas Committee, referred to the recent reduction in the price of gas—a reduction ranging from 3d. to ½d. per 1000 cubic feet. He remarked that the idea was that the price now prevailing might be something like permanent—at any rate, for a few years. They had been able to make the reduction in the face of an advanced price for coal. Under the system prevailing before the passing of the last Act, the Corporation had gratuitous gas for public lighting, the cost of which would have amounted to £6500. In lieu of this, there was now a reduction of £9160 to gas consumers. It was only fair to say that one-third of the reduction would go to the out-townships, which would get a little of what they had thought for many years they were entitled to. The consumers within the borough had a permanent reduction of £6000, instead of the borough fund getting indirectly something like the same sum through gratuitous gas. Alderman J. Wild objected that there was one class in the community which never seemed to be catered for by the Gas Committee—that was the class composed of people who used gas-engines. The Committee ought not to charge the same price for driving an engine as they did for lighting an ordinary cottage. Alderman Thompson replied that the Committee had many times considered the question raised by Alderman Wild, but had never been able to see their way to reduce the price for power. To do so would be at the expense of the ordinary consumers. Day or night use made no difference to the Gas Department.

Reduction in Price at Radcliffe.—The Directors of the Radcliffe and Pilkington Gas Company have resolved to reduce the price of gas 1d. per 1000 cubic feet. To ordinary consumers the charge will now be 2s. 1od.; and a concession is made to prepayment meter users.

Salford Corporation's New Bill.—At a meeting of the Salford Town Council last Wednesday, a recommendation was made by the Gas Committee that the Parliamentary and Public Trusts Committee be informed of the desire of the Gas Committee to give notice of application for a Bill for gas purposes similar in terms to the Bill of last year. Councillor Jackson said the Council ought to have more information than was given in the minutes, especially remembering what happened to the last Bill in regard to the gas clauses. Alderman Phillips, the Chairman of the Gas Committee, said it was not desirable to discuss the matter in open Council; but he was prepared to give any information the Council wished in private. It was resolved to hold a General Purposes Committee meeting in private at the conclusion of the business of the Council. At this meeting, Alderman Phillips explained the proposals of the Gas Committee, and the Committee approved of the minute. It is understood that the Salford Gas Committee will arrange terms with the local authorities within their supply area, and thereby avoid the opposition which was put forward against the last Bill by these authorities.

Street Explosion at Loughborough.—Last Thursday morning, a gas explosion occurred at the corner of Biggin Street, Loughborough, which resulted in a considerable portion of the pavement being blown up, as well as an electrical box-cover being smashed. Some of the Gas Company's men were said to have been at work on a leakage a few yards away with a blow-pipe; and the suggestion is that the flame must have thus been conveyed to the chamber, where there was an escape of gas. Fortunately, no damage was done to the surrounding places of business.

Electricity at West Hartlepool.—In the West Hartlepool Town Council, Alderman Macfarlane, who is Chairman of the Electric Lighting Committee, took strong exception to some remarks made by a Mr. Ropner about the electric light undertaking at the recent annual meeting of the Hartlepool Gas and Water Company, and said they would never have been uttered about any private undertaking. If they had, they would have been actionable. The inference from Mr. Ropner's statements was that the Corporation electric light undertaking was not carried on in a businesslike fashion, and that proper allowance was not made for depreciation and wear and tear. As a matter of fact, for several years past the undertaking had paid 7 per cent. on the gross capital invested. Half of this had been devoted to interest, and half to depreciation. There had also been a small balance in hand. Altogether, Mr. Ropner's remarks were utterly unwarranted.

Electric Street Lighting at Watford.—At the last meeting of the Watford Urban District Council, the Clerk stated that a communication had been received from the Local Government Board enclosing five sanctions for electric lighting loans. Mr. Whitlock asked for the letter to be read; but Mr. Goodrich strongly objected to this being done. The fact of the matter was, he said, that there were some strictures at the end of the letter concerning public lighting, and suggesting that the Council should look further into the question of using gas. The answer to this was that 150 street-lamps had been converted to metallic filament lamps, and between 30 and 40 were being changed. No good purpose would be served by making the letter public. Mr. Whitlock said he was acting in the public interest, and he supposed that the reason that the letter was not read was because it was not very complimentary to the Electricity Committee. It was to be remembered that the Gas Company were ratepayers, and were concerned to some extent in the matter. Mr. Rider, after mentioning that he was opposed to municipal trading on principle, went on to say that it would be absurd for the Council to reveal to their commercial rivals their secrets. The Clerk thought the Board's letter was for the information of the members of the Council, and not of the general ratepayers of the district. Mr. Whitlock pressed for the letter to be read. There was an Association opposed to the granting of the loan; and he considered it was only fair that they should know the feelings of the Local Government Board. The Chairman (Mr. Mobbs) said if Mr. Whitlock had the best interests of the undertaking at heart, he would not go further with the matter. It was finally decided to consider the matter in committee at the end of the Council meeting.

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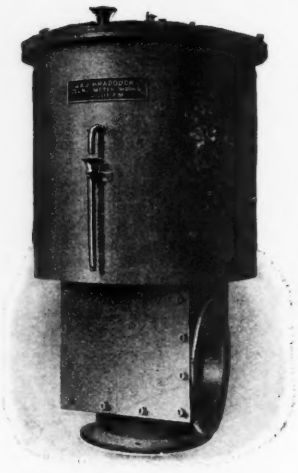

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A Loss at Pontefract.—It was reported to the Pontefract Corporation last week that there was a loss of £500 during last year on the gas undertaking, caused by defalcations from the safe, prosecutions, a special audit, and the cost of a Special Act of Parliament.

Keswick Gas Company.—Mr. E. Jackson, presiding at the annual meeting of the Keswick Gas Company, was able to lay a very satisfactory state of affairs before the shareholders. The year ended June 30 had, he said, been one of steady trade and slightly increased revenue. After paying the usual dividend of 10 per cent. upon the original and 7 per cent. upon the additional capital, and putting aside £100 for contingencies, there would be a carry-forward of £66. The gas sold amounted to 20,601,400 cubic feet, or an increase of 1,588,800 feet over the previous year. The make per ton was 10,622 cubic feet, or 403 feet more than the year before; while the sale per ton was 9777 cubic feet, or 98 feet more. The Company are erecting a new showroom near the works. It was announced that the Board have decided to reduce the price of gas used for power by 3d. per 1000 cubic feet.

The Stockport Corporation have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for the whole of the coal and coke handling plant, including a "Telpher" scheme, in connection with the new inclined retort installation in course of construction. It will be remembered that the same firm carried out the whole of the coal and coke installation in connection with the first large installation of inclined retorts erected at Stockport.

Mr. W. O. E. Meade King, of the Local Government Board, held a public inquiry at Hebden, near Grassington, last Tuesday, respecting an application to borrow money for works of water supply. Agreements were presented showing that the riparian owners consented to certain water being taken, provided that water be supplied to specified land in the event of its being deprived of water in consequence of the works. The scheme was explained in detail by Mr. A. Rodwell, the Engineer to the Skipton District Council. The present supply was ample, he said, except during the dry summer months; and it was proposed to augment it by taking in part of a spring at Brown Haw Well. There was no opposition on the part of the landowners.

A conference of the travellers of the Davis Gas Stove Company, Limited, recently took place at the Diamond Foundry, Luton, and was attended by all the firm's representatives, as well as three of the Managing Directors. The conference lasted for two days, the first of which was devoted to a general discussion concerning several important measures to be adopted with regard to next season's cookers and other summer specialities. The greater part of the second day was occupied by an inspection of the large number of new gas-fires and other heating apparatus introduced for the present season. The representatives were personally conducted by the experts of the firm's chemical and physical laboratories, and also the new enamelling works—the latter branch particularly making a considerable impression upon those present.

It is stated that a writ has been served upon the Stafford Town Council for a declaration by the Chancery Division that the water-works at Milford are not authorized by the powers of the Corporation, and for an injunction restraining the Corporation from maintaining or using the works, or proceeding with any extension of them.

Messrs. John Spencer, Limited, of Wednesbury, have issued the 25th edition of their iron and steel tube and fittings price list. It is of convenient size for the pocket or desk, and is filled with illustrations and particulars of the firm's specialities, many of which are, of course, of a kind that is useful in connection with gas and water supply.

APPLICATIONS FOR LETTERS PATENT.

19,943.—Dessauer Vertikal Ofen G.m.b.H., "Liquid seals for dip-pipes." Aug. 26.
19,964.—Hanwell, H. W., "Anti-vibrators." Aug. 26.
19,992.—Elliott, S., "Purifying fumes and gases." Aug. 27.
20,072.—Dod, G. E., "Gas-turbines." Aug. 29.
20,083-4.—Hubers, J., "Inverted gas-lamps." A communication from Julius Pintsch Akt.-Ges. Aug. 29.
20,090.—Siemens Bros. Dynamo Works, Ltd., and Kieffer, E. O., "Non-return valves." Aug. 29.
20,135.—Aldridge, J. G. W., "Chargers for gas-retorts." Aug. 29.
20,137.—Edmonds, J. E. J., "Automatic water-pipe cleaner." Aug. 29.
20,144.—Koppers, H., "Levelling the charge in ovens for manufacturing gas and coke." Aug. 29.
20,173.—White, O. H, and Sharpe, J., "Supplying heated air from burners, stoves, or the like." Aug. 30.
20,231.—Wilson, J. S., "Measuring the depths and velocities of fluids." Aug. 30.
20,245.—Falding, F. J., and Cathcart, W. R., "Purifying gas and recovering values present therein as impurities." Aug. 30.
20,343.—Mansfield, A., "Incandescent burners." Aug. 31.
20,401.—Lamkin, A. E., and Bridge, L. F. M., "Gas-heating appliances." Sept. 1.
20,442.—Warner, W. J., and Lichty, D., "Instantaneous water-heaters." Sept. 1.
20,445.—Campbell, J. A., "Retort-furnace settings." Sept. 1.
20,546.—Brown, A. A., "Boxes for mantles." Sept. 3.
20,562.—Schäffer and Budenberg, Ltd, "Pressure-gauges." A communication from Schäffer and Budenberg G. m. b. H. Sept. 3.
20,566.—Ofenbau G. m. b. H., "Gasholders." Sept. 3.
20,569.—Hubers, J., "Gas-lamps." A communication from Julius Pintsch Akt.-Ges. Sept. 3.
20,571.—Dickie, D., "Mantles." Sept. 3.
20,572.—Weller, F. W., "Regulating the flow of gas." Sept. 3.
20,574.—Cowper-Coles, S. O., "Reflectors." Sept. 3.
20,604.—Gilsbach, C., "Gas-turbines." Sept. 3.

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FILTER PRESS. Sutton (Surrey) Gas Company.
STREET GAS-LAMPS. Carmarthen Town Council. Tenders by Oct. 15.
MAIN DRILLING APPARATUS. No. 5283.

Stocks and Shares.

WESTON-SUPER-MARE GAS COMPANY. Sept. 20.

TENDERS FOR

Coal.

NEWTOWNARDS GAS DEPARTMENT. Tenders by Sept. 29.

Coke.

WANDSWORTH AND PUTNEY GAS COMPANY. Tenders by Sept. 16.

Pipes, &c.

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Resists 4500° Fahr. Best for GAS-WORKS.
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DIGGERS AND SUPPLIERS OF THE
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Best Percentages. For lowest Quotations to any Port, Station, or direct into Works, please apply to—
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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
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The Manufacture of
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HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
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Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

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The M.H. GAS PLANT produces at will :—
METHANE HYDROGEN GAS from Coke, Tar, Steam, and either Benzol or Tar enrichment.
BLUE WATER GAS from Coke and Steam.
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JOHN RILEY & SONS, Chemical Manu-facturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

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SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges at One Stroke.
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SPECIALLY prepared for Sulphate of AMMONIA Makers by
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SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
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Consumers in any form are invited to correspond with Chance and Hunt, Ltd., Chemical Manufacturers, Oldbury, Worcs.

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SYPHON PUMPS
of the very latest improved design.
Apply early
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GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the *best*. Satisfaction Guaranteed.

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SUCCESS by Saltation for most is im-probable; the law of averages indicates system, backed by expert advice, as giving the surest results. Discard spasmodic, amateur efforts, and write now Herbert Greatorex, Application Specialist, Beechwood, Matlock.

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Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

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THE Work of these Departments is carried on in separate Blocks of Buildings specially equipped for Systematic Instruction.
Prospectus may be had free on Application from the Registrar.
The next Session begins on Oct. 4, 1910, on which day the Entrance Examination will be held at Ten a.m. and Two p.m.
W. F. Husband,
Registrar.

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Conducted by
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Teacher: HERBERT LEES (Silver Medallist), Assoc.M.Inst.C.E., Engineer and Manager of the Hexham Gas Company, Lecturer at Rutherford College, Newcastle-on-Tyne.
For Terms, &c., address Elvaston Road, Hexham.

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SUPERINTENDENT (Age 30), with thorough knowledge of all technicalities and proved ability to educate consumers privately or by public demonstration. First hand knowledge of U.S.A., Colonial, and Continental Methods for securing maximum economical consumption; has recently visited leading Metropolitan and Provincial Undertakings and noted latest Revenue Yielding Ideas; unbroken record of successful results; desires scope for energies as above. Salary partly based on results preferred.
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WANTED, at once, Capable Manager for Small New Gas-Works being built, able to Superintend Erecting and Main Laying.
Replies, stating previous Employment, and Wages expected, to No. 5287, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, immediately, Two or Three DRAUGHTSMEN, fully Experienced in the Design of Modern Gas Plant.
Apply, by letter, Stating Age, Qualifications, and Salary required, to No. 5268, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

GAS-STOVE Manufacturing Company requires a GENERAL MANAGER possessing good Commercial Experience, and Technical Knowledge. Salary offered £400 per annum with Commission.
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WANTED by a Firm of Ironfounders and Chemical Engineers, with Established Trade among Chemical Manufacturers, to undertake the Sole Rights of Making and Selling Chemical Specialities in Great Britain.
Apply No. 5262, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

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WANTED, a Retort-House Foreman, Age 30 to 35, must be a Good Mechanic and thoroughly acquainted with Methods of Carbonizing. One with Electrical Knowledge preferred.
Apply, stating Age, Qualifications, and Salary required, to No. 5281, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, by the Leyburn Mutual Gaslight and Coke Company, a Practical GAS MAKER and FITTER, able to Take Meters if necessary and Capable of Managing Small Works. Annual make, Two to Three Million Cubic Feet. House, Coal, and Light found. Must be a Steady Man. Testimonials wanted from previous situation.
Applications, stating Age, Experience, and Wages required, to the Secretary, Leyburn, Yorkshire.

WANTED, at once, for a Foreign Ap-pointment, a thoroughly Well Qualified GAS ENGINEER, about 28 to 35 years of Age. Salary offered, £350 per Annum, with a further sum to be agreed upon for each Works erected or extended. The Gentleman selected must be fully Qualified to Advise as to the Capacity, Design, and Cost of every part of a Modern Gas Plant, and Capable of Superintending, first the Erection and subsequently the Working of the Plant. In the first instance it is not necessary to send any Testimonials; these will be asked for later from Applicants whose Experience seems to render their Appointment suitable. Term of Appointment, Three to Five Years.
Applications to be addressed to No. 1047, Sell's Advertising Offices, Fleet Street, London.

FOR SALE—A First-Class Safety Gas Tap, Provisionally Covered.
Address No. 5288, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

FOR SALE—Filter Press in Perfect Condition. Self-Contained Engine and Pump.
Apply to the Secretary, Gas Company, Sutton, Surrey.

OFFERS wanted for the Files of the "Journal of Gas Lighting," "Gas World," and "Chemical Trade Journal," for the Years 1905 to 1909, inclusive, unbound.
Address Brotherton and Company, Limited, City Chambers, Leeds.

GASHOLDERS—16 ft., 24 ft., 26 ft., and 45 ft. Diameter GASHOLDERS, Cheap for immediate Sale. Re-erected in either Brick or New Steel Tanks Complete to Plan and Specification. Can be seen Temporarily Erected at our Works.
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UNDER Pressure Main Drilling Apparatus FOR SALE, complete with Cup Drills and Change Blocks, for Cutting Connections for 3 in. to 6 in. diameter. Also APPARATUS complete with Cup Drills and Change Blocks for Making Connections from 7 in. to 12 in. diameter. Both Machines quite New, and packed in suitable Boxes.

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SALE OF STREET LAMPS, &c., BY PRIVATE TREATY.

THE Carmarthen Town Council have for DISPOSAL about 230 STREET GAS LAMPS, COLUMNS, and BRACKETS, and a Number of INCANDESCENT BURNERS. Offers are invited for the whole or part. All Particulars can be obtained at the Borough Surveyor's Office, John Street.

Tenders, marked "Tenders for Lamp Posts, &c.," to be sent to the undersigned not later than the 15th of October, 1910.

The highest or any Tender not necessarily accepted.

JAMES JOHN,
Town Clerk.

Town Clerk's Office, Carmarthen,
Aug. 18, 1910.

WISBECH WATER-WORKS COMPANY.

TENDERS are invited for the Supply of about Six Miles of 3-inch CAST WATER MAIN, full Particulars of which can be had on Application to the Company's Engineer, at his Office, Wisbech.

The lowest or any Tender will not necessarily be accepted.

J. G. HAWKINS,
Engineer and Manager.

Gas and Water Offices,
Wisbech, Sept. 9, 1910.

COKE.

THE Directors of the Wandsworth and Putney Gaslight and Coke Company invite TENDERS for the Removal of about 15,000 Tons of Guaranteed "WANDSWORTH" COKE from their Works at Wandsworth, between Oct. 1 next and March 31, 1911.

The Coke to be removed by Van or by Barge (free waterway on River Thames).

Sealed Tenders, endorsed "Tender for Coke," to be delivered not later than Sept. 16.

The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.

Any further Information may be obtained from the Engineer, Mr. H. O. Carr.

CHAS. W. BRAINE,
Secretary.

Wandsworth and Putney Gaslight
and Coke Company, Fairfield Street,
Wandsworth, S.W.

BOROUGH OF ABERAVON.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply of the following GAS MAINS and SPECIALS to be delivered free at the Great Western Railway Company's Station, Port Talbot.

2190 Yards of 10-inch coated S. & S.
3400 " 4-inch " "
Specials per Ton " "

Tenders to be delivered to M. Tennant, Esq., Town Clerk, Aberavon, not later than the 17th inst., marked "Tender for Gas-Mains."

The lowest or any Tender not necessarily accepted.

A. J. BOND,
Manager.

Gas-Works, Aberavon,
Sept. 2, 1910.

NEWTOWNARDS URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TENDERS FOR COAL.

THE Newtownards Urban District Council (Co. Down) are prepared to receive TENDERS for the Supply of 3000 to 4000 Tons of GOOD COKING COAL, NUTS OR SLACK (Washed or Otherwise).

Further Particulars may be had on Application to the Gas Manager, Mr. W. H. Roberts.

The Council reserve the right to fix the whole or part of the Contract with one or more Contractors.

The lowest or any Tender not necessarily accepted.

Sealed Tenders, marked "Tender for Coal," will be received by me up to Thursday, the 29th of September, 1910, at Four o'clock.

H. MCCARTNEY,
Clerk to the Council.

Sept. 6, 1910.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 21st inst., at Twelve o'clock precisely, to transact the usual Business; to declare a Dividend for the Half Year ended the 30th of June last; to elect Two Directors in the place of those who go out by rotation; and to appoint Two Auditors.

NOTICE IS HEREBY ALSO GIVEN that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 10th inst. and RE-OPENED on the 22nd inst.

By order of the Court of Directors,
A. W. BROOKES,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.
Sept. 2, 1910.

PATENTS AND DESIGNS ACT, 1907.

NOTICE is Hereby Given that Joseph Margreth, of Locano, Switzerland, seeks leave to FURTHER AMEND the SPECIFICATION OF LETTERS PATENT No. 24,490 of 1904, granted to Franklin Wise Howorth, for "IMPROVEMENTS IN ACETYLENE STORM LAMPS."

Particulars of the proposed amendment were set forth in the Illustrated Official Journal (Patents) issued on the 7th of September, 1910.

Any person or persons, may give notice of opposition to the Amendment (on Patents Form No. 18), at the Patent Office, 25, Southampton Buildings, London, W.C., within one calendar month from the date of the said Journal.

W. TEMPLE-FRANKS,
Comptroller General.

ABEL AND IMRAY,
Consulting Engineers
and Chartered Patent Agents,
Birkbeck Bank Chambers, London, W.C.

THE Proprietor of the Patent No. 19,479 of 1905, for "Improvements in or relating to Meters," is desirous of entering into Arrangements by way of License and otherwise, on Reasonable Terms, for the purpose of Exploiting the same and ensuring its Full Development and Practical Working in this Country. All Communications should be addressed in the first instance to HASELTINE, LAKE, AND CO., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

GAS STOCK.

SALE OF DEBENTURE STOCK AND ORDINARY STOCK IN THE WESTON-SUPER-MARE GASLIGHT COMPANY.

LALONDE BROS. & PARHAM have received Instructions from the Weston-super-Mare Gaslight Company to SELL BY AUCTION, under the Provisions of the Weston-super-Mare Gas Act, 1901, at their Rooms, West Street, Weston-super-Mare, on Tuesday, the 20th of September, 1910, at Six for Seven o'clock in the Evening, subject to Conditions of Sale,

£2000
FOUR PER CENT. PERPETUAL DEBENTURE STOCK and
£3000
NEW FIVE PER CENT. MAXIMUM ORDINARY STOCK

of and in the above-named Company, in Lots of the nominal value of £50 each.

The Stocks will be Sold and Registered in the Books of the Company Free of every Expense to the Purchasers thereof.

For further Particulars and Conditions of Sale Apply to the AUCTIONEERS, High Street and Station Road, WESTON-SUPER-MARE, and 7, Royal Promenade, BRISTOL: to J. H. GRAY, Secretary to the WESTON-SUPER-MARE GASLIGHT COMPANY; or to J. H. & F. W. BERE, Solicitors, WESTON-SUPER-MARE.

COOKE, ENNEVER & TULK,
Stock Brokers,
17 & 18, NEWGATE STREET, E.C., and PRINCE'S CHAMBERS, BIRMINGHAM.

We are Buyers and Sellers by Private Treaty of Stocks, Shares, and Debentures in approved Old Established Water or Gas Undertakings, and make this a speciality. Prices quoted on Application.

New Capital Issued, Municipal Loans arranged.

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MIDLAND ENAMELLING CO.,
Manufacturers of
DIALS (Enamelled)
For Gas, Water, Electric, &c., Meters.
DIALS
For Pressure Scales in One Length up to 4 feet.
DIALS
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Telephone: "Northern 250." Telegraphic Address: "ENAMELLING BIRMINGHAM."

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Makers of Cast-Iron PIPES and CONNECTIONS for Gas, Water, Steam, Electrical, Sanitary, and other purposes; also TANKS, COLUMNS of every description, Hydraulic, Gas, and Colliery PLANT, &c.

Illustrated Catalogue, giving complete list of our manufactures, on application.

Works: BIRTLEY, CO. DURHAM.
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Gas Engineers' Agents and Contractors for METERS, FIRE-CLAY GOODS, OXIDE OF IRON AND ALL OTHER GAS APPARATUS.
Inquiries Solicited.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

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Those desiring to obtain Gas Calorimeters as used in the Official Testing Places should see that the apparatus bears the name of the Original makers.
Descriptive Catalogue on Application.

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NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

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STEEL OF ALL DESCRIPTIONS.
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MIRFIELD GAS COAL.

UNEQUALLED.

Sperm Value 878·85 lbs. per Ton.

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Results obtained which have never been Surpassed by any other System of Carbonization.

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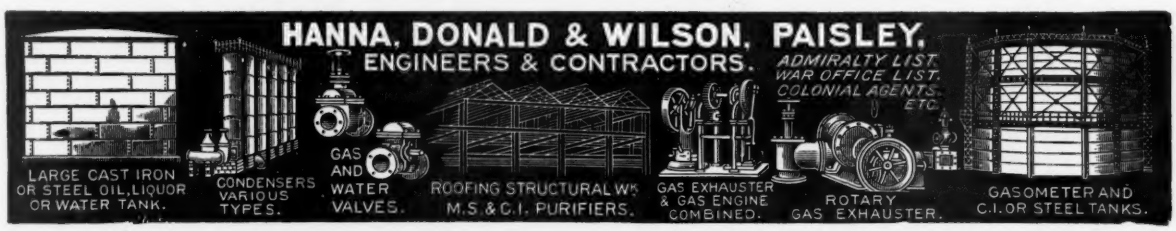
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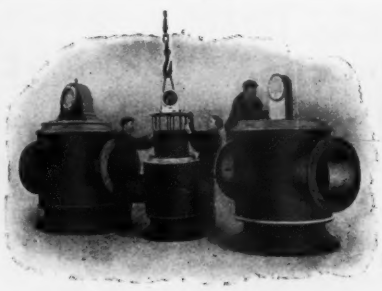

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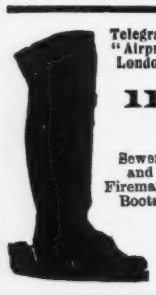

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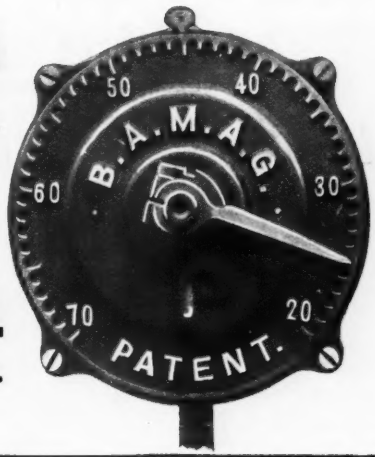

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As a labour saver, this speaks for itself, but in addition there is lessened risk, worry, and anxiety for the management.

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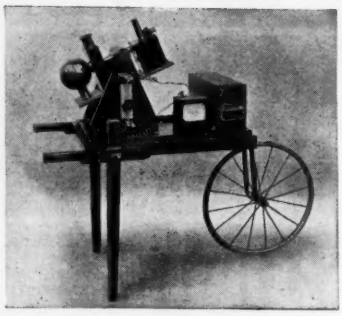

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measures, through observations on a Pressure Gauge of the increase of Pressure of the Air surrounding an explosion pipette, the heat imparted by the latter to that Air.
It works without Water Supply and Waste-Pipe.
No Preparation requ red. Readily Portable.
A Test is made in Three to Five Minutes.
Great Exactness.
Suitable also for Suction Gas and Power Gas.

PRICE £15, *ex* Vienna, Packing Extra.

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THE NEW RETORT

Will withstand high temperatures and is **Guaranteed not to Contract or Soften** under Heat.
GREATER CONDUCTIVITY THAN ANY FIRE-CLAY RETORT.

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Is synonymous with "Strength" in
CIRCULATORS AND GAS-FIRED STEAM BOILERS.

Manufactured by
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"OVEE" GAS COMPRESSORS,

Representing over **Fifteen Million Candles,** have been supplied up to now for one single City—Berlin.

NO DANGEROUS MIXTURE OF AIR AND GAS.

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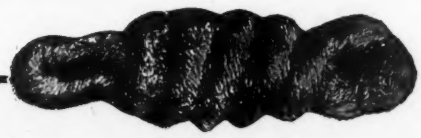

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Is sent out in Skeins all ready for use.
Every Skein of equal weight and length.
The Lead Wool Joint is built up evenly all the way through.
Lead Wool requires no melting and can be used in water without risk.

Lead Wool Joints are Twice as Strong as Cast Lead Joints and cost 33⅓ per cent. less.

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STOP WASTE AND LEAKAGE

They are guaranteed not to contract and do not readily split and fracture but retain apparent wholeness after a long period of work.

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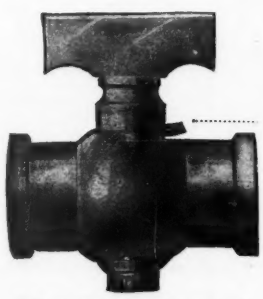

FIG. 1. The Old Style with the Old Trouble. Note the Pin **A.**

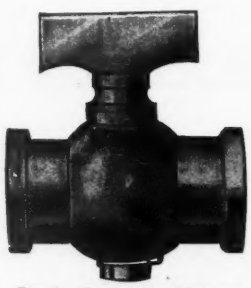

FIG. 2. **Evered's Patent "Safety Stop."** No Pin. No trouble.

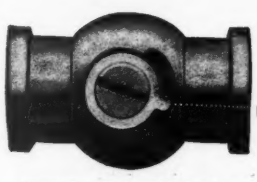

FIG. 3. Underside showing "Safety Stop" in lieu of Pin.

EVERED'S PATENT "SAFETY STOP."

Buyers of Gas Fittings are familiar with the trouble constantly arising through the Stop Pin of the Tap or Cock getting bent or broken, or falling out, thus leaving the Tap without a Stop, and leading to great danger of an escape of Gas.

EVERED'S PATENT "SAFETY STOP"

renders the old Stop Pin unnecessary and is an absolutely **Safe and Permanent Stop.**

The projection shown in Fig. 3, marked **B,** working in the recess shown in Block, allows the Tap to be turned only so far as the recess extends. There is no possibility of the Tap turning further round as there is no Pin to become displaced or broken.

Any fitting specifically so ordered will be made with the "Safety Stop."

EVERED & CO., LTD.,

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SELF-INTENSIVE HIGH-POWER LAMP

Is the Best Proof of its Usefulness.

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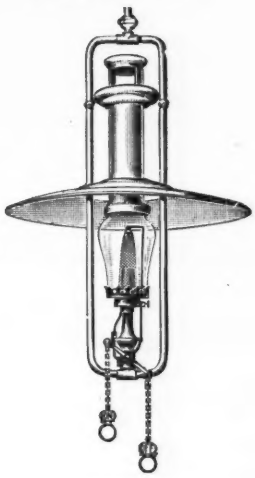

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ABSOLUTELY WIND, DUST, AND INSECT PROOF.

200, 400, and 700-Candle Power from a Single Mantle, with Gas at its usual Pressure, and Lowest consumption on record.

WONDERFUL VALUE.

ALL BRITISH.

THE **"REFORM."**

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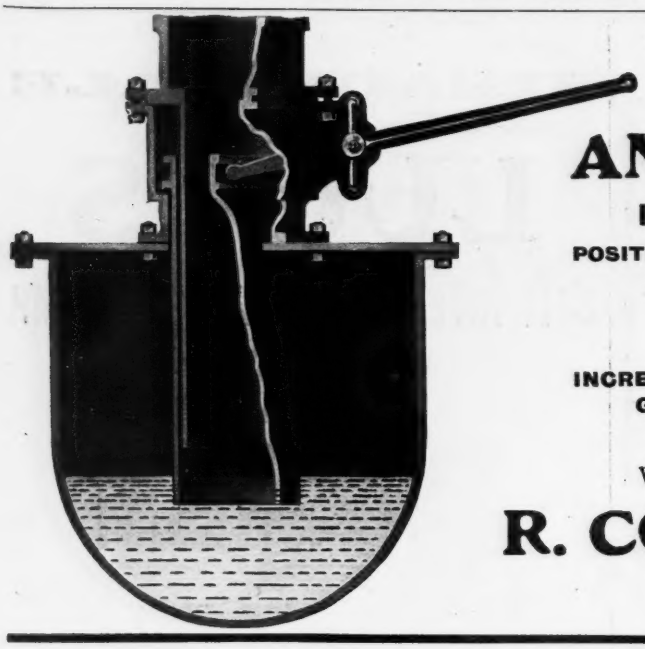

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GREATER ILLUMINATING POWER,
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The British Coalite Company having failed in their proceedings against us, we are now prepared to grant **Licenses,** both **at Home and Abroad,** on Reasonable Terms, to Corporations, Gas Companies, and others, for the Manufacture under our Patents of

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By our methods, results superior to other processes can be obtained.

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GAS COOKERS
AND
BRASS GAS FITTINGS
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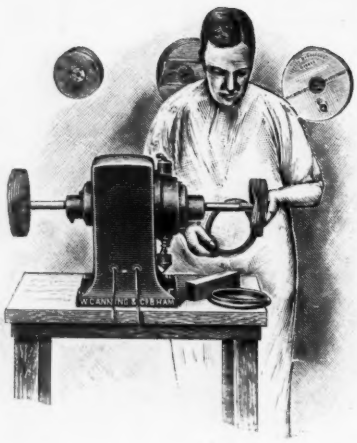

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Our Goods are used by all the Leading Manufacturers. Goods Specially Packed for Export.

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LIGHT
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

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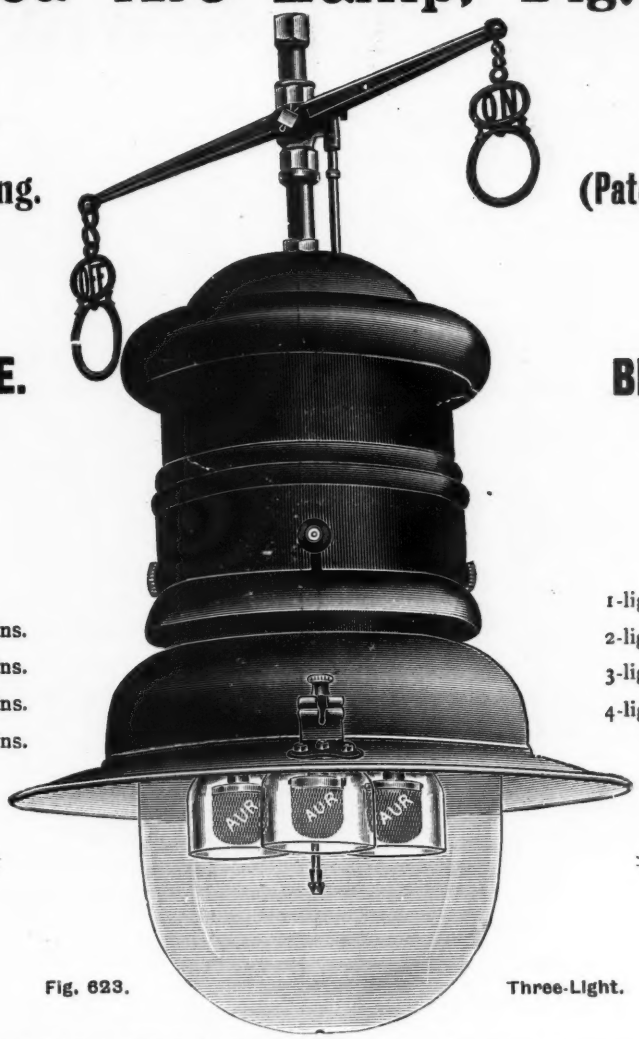

Fig. 623. Three-Light.

Height over all.

1-light . . .	1 ft. 8 ins.
2-light . . .	2 ft. 4 ins.
3-light . . .	2 ft. 4 ins.
4-light . . .	2 ft. 7 ins.

Width over all.

1-light . . .	1 ft. 1 in.
2-light . . .	1 ft. 5 ins.
3-light . . .	1 ft. 5 ins.
4-light . . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	*C.P.*	*Steel.*	*Copper Case.*		*Gas per hour.*	*C.P.*	*Steel.*	*Copper Case.*
1-light	4 feet	125	**30/-**	**5/-** extra.	3-light	12 feet	400	**52/6**	**6/-** extra.
2-light	8 feet	260	**47/6**	**6/-** extra.	4-light	16 feet	550	**72/6**	**9/-** extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3/6** per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Clear Glass Globes, each	**2/3**	**5/9**	**5/9**	**9/-**
" " " In Case lots per dozen.	**19/6**	**57/9**	**57/9**	**93/-**
Case contains . .	*80*	*18*	*18*	*12*

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Wired Globes, extra each	**2/-**	**2/-**	**2/9**	**3/6**
Parabolic Reflector, extra "	**3/6**	**6/-**	**7/6**	Not made

Welsbach Mantles, **4½d.** each, or **4s. 3d.** per dozen, subject as usual.

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price **4½d.** each.

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"CYCLONE"
TAR EXTRACTOR.

No Steam.
No Moving Parts.
No Power.

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GAS-WORKS can Sell
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TOOLS, &c.

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Coke Barrows.
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Main Laying Tools.
&c., &c.

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Established 1818.

MECHANICAL
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HANDLING
PLANTS
OF ANY MAGNITUDE
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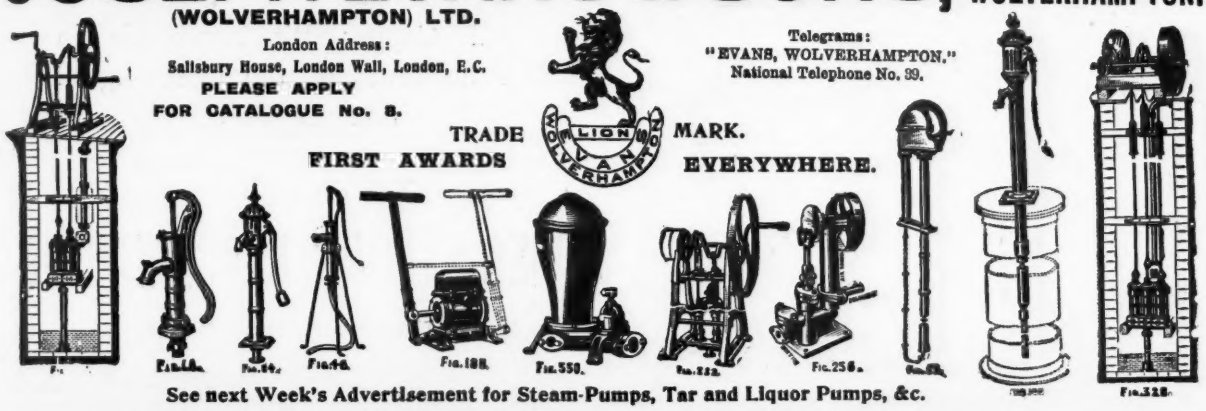

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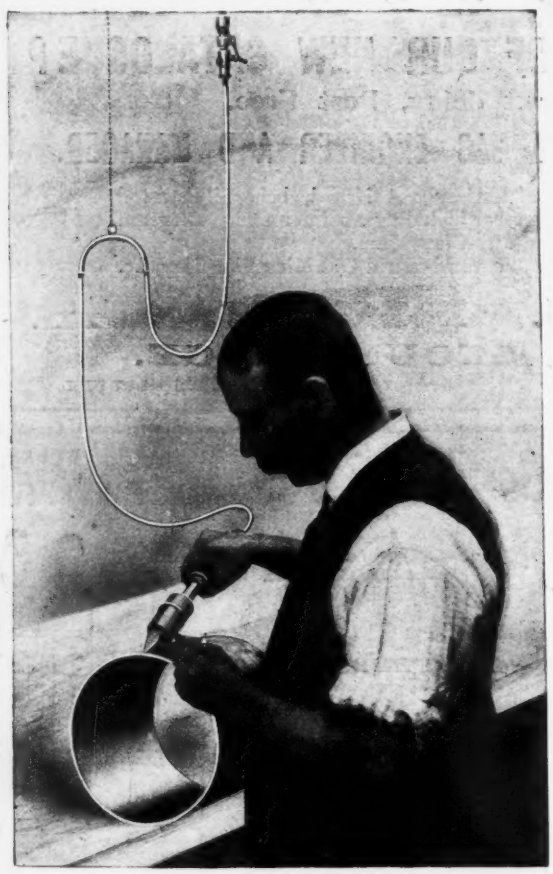

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RAPID AUTOMATIC FASTENINGS
15,000 Sold, and
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